WIN A Dream Computer System!! See page 77.

How To Buy A Modem: Complete Buyer's Guide

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January 1988
Issue 55, Vol. 6, No. 1
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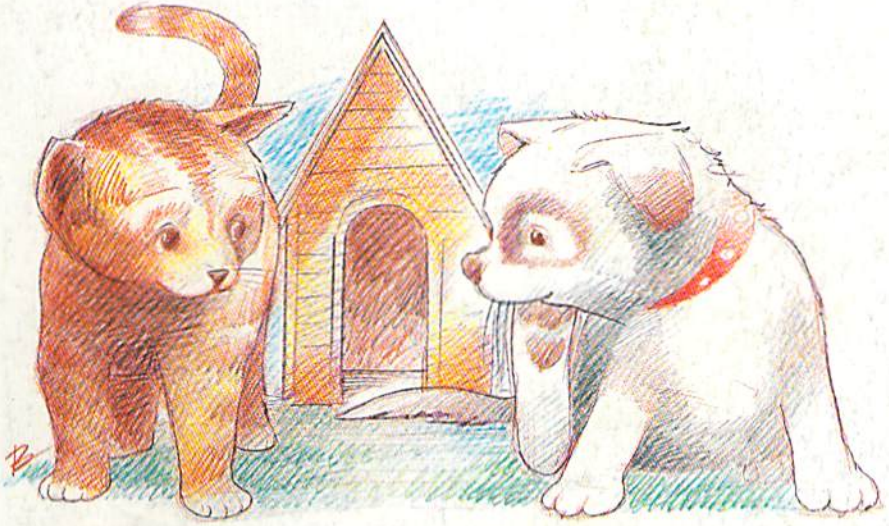

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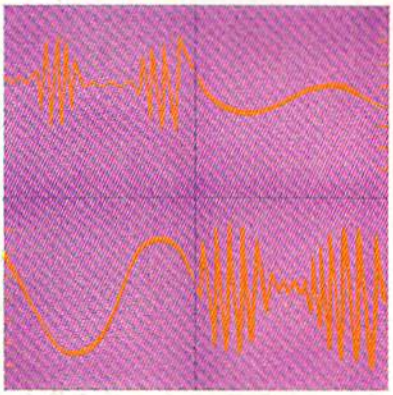

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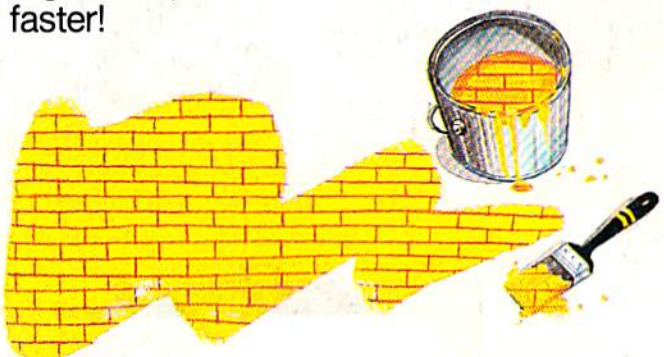

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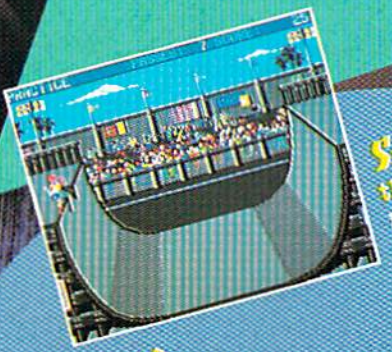

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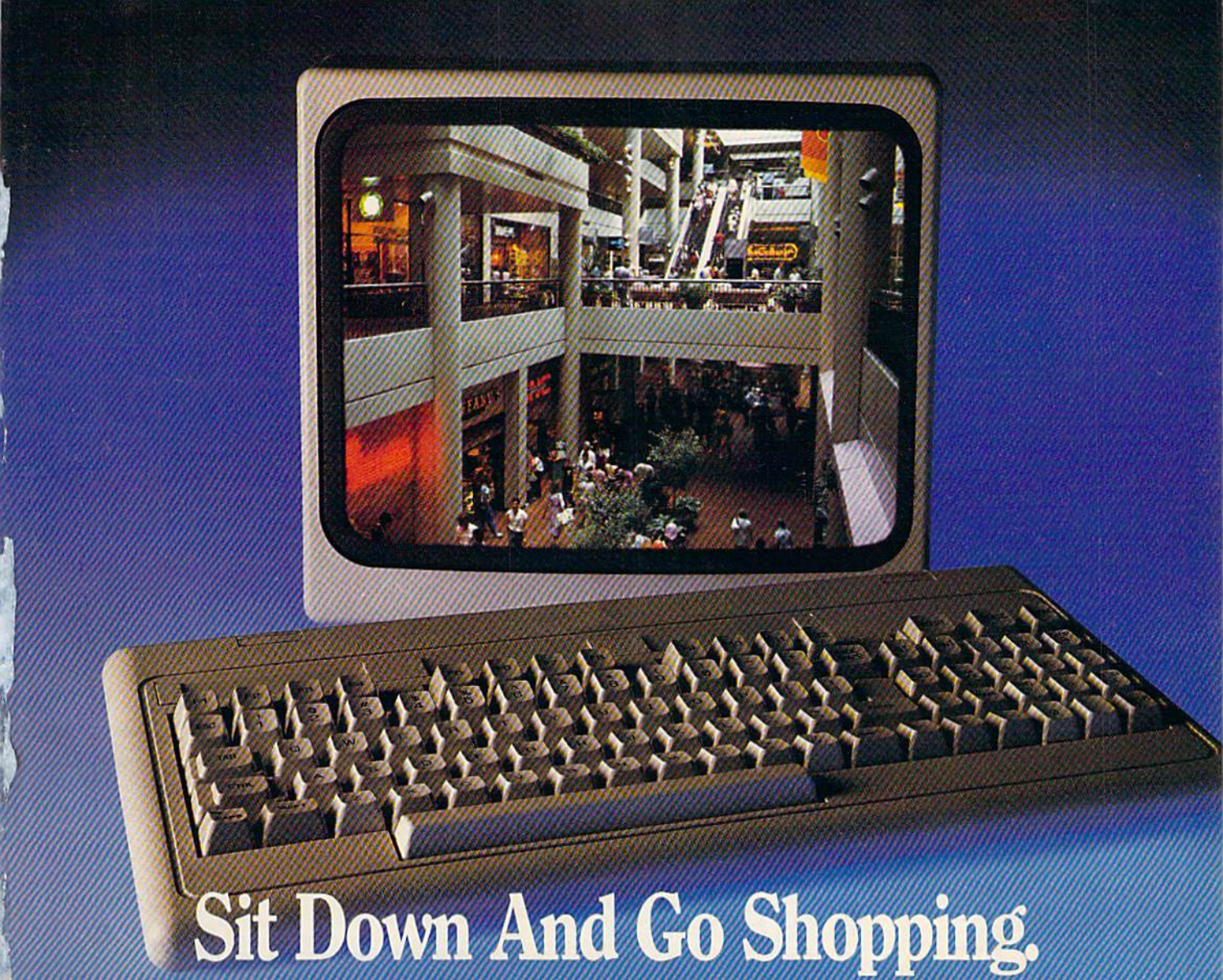

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December 3

Basquing In The Beauty of Andorra

Weather

More people reading stuff like this!

Text can be printed in every font available through GEOS. These documents were printed on an Apple Laser Writer

VANISHING TIMES

A Berkeley Softworks Publication — Vol. XLMIV Number 4567

EARTH TO BEGIN SPINNING IN OPPOSITE DIRECTION

A shocked consortium of scientists confirmed the world's worst suspicions Tuesday, when they announced that the Earth was indeed slowing down. They expect the planet to grind to a halt early Thursday, reversing its direction and getting back up to speed by Monday night.

Although the research was startling, the scientists urged people not to panic.

"I suppose I'd lock all the breakables in your cabinets," offers Dr. Lee Llevano, "but outside of that, I'd just tell people to hold on and enjoy the ride."

Apparently we're in for quite a ride. Dr. Dennis Rowland demonstrated the effect of the sudden reversal by dropping a raw egg into a MixMaster blender set on "puree."

"If we assume people have the consistency of this egg," Rowland asserted, "I think it's safe to say that the effect of this phenomenon will leave them in a state somewhat similar to finely ground beef."

Asked if there were anything the public could do to prepare for the

"I'd just tell people to hold on and enjoy the ride!"

catastrophe, Dr. Rowland thought a while and offered, "I always recommend fastening your seat belt. It just makes so much sense, don't you think?"

Analyst Staci Glovsky was less distressed with the news, asking "What's the big deal? Jeez, you guys are acting like a bunch of

Continued Page 8

MAN BITES POODLE!

BERKELEY — Dozens of citizens watched in horror today as a man, who described himself as an animal lover, actually bit a miniature teacup poodle.

Donald Anderson, of Studio City, California, dismissed the incident as a case of mistaken identity.

"Somebody asked me if I wanted a dog with mustard, and since it was close to lunchtime anyway, I just took a bite without looking."

The dog, responding to the name "Knockwurst," then gave out a yelp that bystanders recalled as sounding like "a cross between a gun shot and

"Sure it was my mustard, but that doesn't prove a thing!"

an air raid siren." In the process, the pinched pooch set a world record in the long jump of thirty feet, two inches.

Anderson was booked on felony charges of dog munching, poodle endangerment and assaulting a canine with intent to commit relish. He was later released on his own recognizance. The man who offered him the poodle has also been charged with attempting to apply mustard to a mutt, a misdemeanor in Alameda County.

"It's a smear tactic," yelled Rob Siegel, the man still being sought by police. "Sure it was my mustard, but that doesn't prove a thing. Besides, they have to prove with

Continued Page 4

Television Highlights

This week, you can expect to find some of the best programs right on your own TV set at home. Following are some of the highlights:

Monday:
(4) 6:30 I LOVE LUCY
Lucy and Ethel hatch a plot to get Lucy into Ricky's show at the club. (R)
(7) 8:30 WILD KINGDOM
Marlon sits on a studio safe and sound, while Jim risks his life for some unimportant animal.

Tuesday:
(2) 7:30 LAWRENCE WELK IN BULGARIA
The famed band leader takes you there go 60 minutes of musical merriment, all the time wondering why he is in Bulgaria.
(5) 9:30 BRUCE LEE IN REVENGE OF THE MEATBALL
Epic hero Bruce Lee punches his way through pasta, and rescues a pizza from 600 Neopolitan Ninjas.

Wednesday:
(11) 6:30 I Love Lucy
Lucy and Ethel hatch a plot to get Lucy into Ricky's show at the club. (R)
(4) 8:30 Gilligan's Island
Gilligan and the Skipper finally wise up and figure out that Ginger and Mary Anne must be getting awfully lonely right about now, and go for (Continued Page 4)

Weather

Local weather: Look for clouds throughout the morning, burning off near midday. Temperatures should soar to the mid 200's by late afternoon with heavy electrical activity and thunderstorms appearing around, oh, say

Continued Page 2

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These days, the biggest story in the news is geoPublish. The page-making program for GEOS-equipped 64's and 128's that replaces lifeless layouts with page after page of powerful, punchy professionalism.

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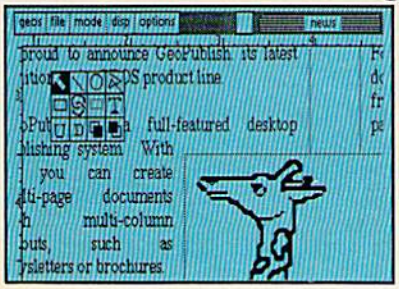

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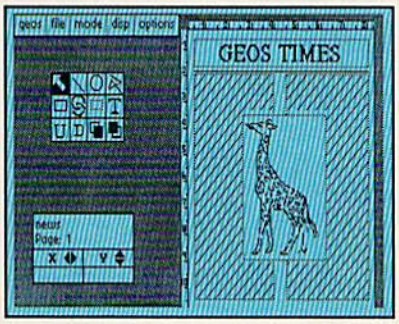

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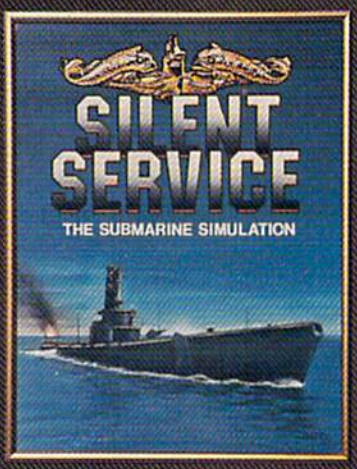

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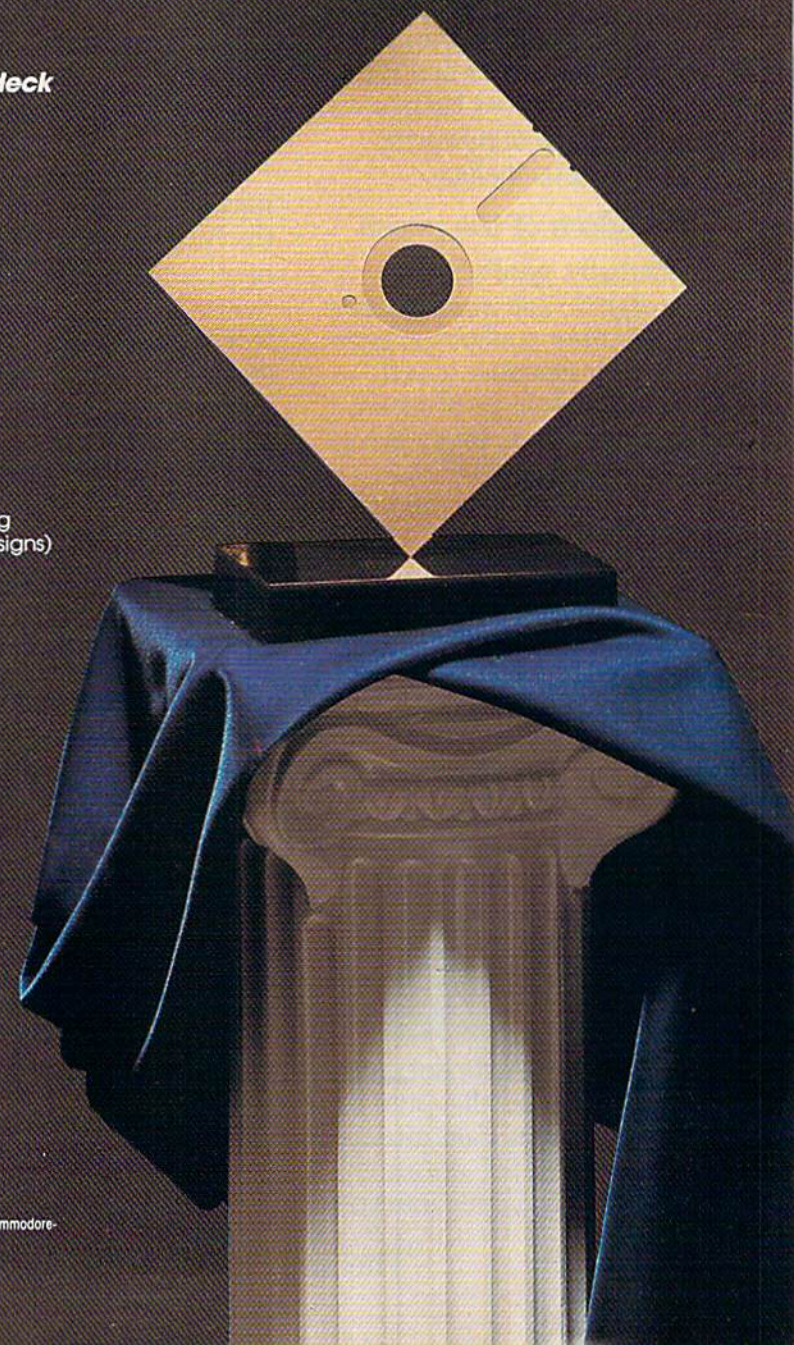

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*=General, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

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editor's notes

Commodore created something of a stir at the recent Software Publisher's Association conference in Cambridge, Massachusetts. In a combination presentation/rap session, Commodore executives—including Chairman Irving Gould—announced in no uncertain terms that the company, for the first time in a while, is on the move, and that it knows exactly where that movement is headed.

Commodore is after substantial gains in the consumer, business, and education markets. Marketing and distribution have been revitalized. A new initiative has been launched to show educators the advantages of Commodore products. Dormant for a while in major media marketing, Commodore is back this fall and winter with a vengeance. Commodore is going to let the public know about its products. More important, Commodore is letting the public know it supports those products—that the company has its eye once more on being the number one consumer choice for microcomputers.

That ambition is backed by a significant amount of television advertising, not just for the new Amigas, but also—and tellingly—for the 64. According to Commodore's Gail Wellington, more than a million 64s were sold last year and the company sees an equally bright market in the year ahead. Television, print, and point-of-purchase advertising campaigns and promotions are being launched to let consumers know about the advantages of the 64. Nor has the 128 market been overlooked. The original 128 has now transformed into the 128D (a 128 with a built-in disk drive). The 128 continues to sell well, and Commodore remains committed to it.

This renewed marketing and advertising thrust for the 64 is a response, not only to ongoing consumer demand for the computer, but also to the dynamic resurgence of consumer interest in video-game machines. The past 12 months have seen Nintendo and Sega rack up huge sales for their arcade-style game machines, which play cartridge games and little more. It is to Commodore's credit that the company is unwilling to let this market slip completely into the hands of limited game equipment.

Of course, Commodore has other things on its mind as well. You know, and we know, that the 64 is a far more powerful and versatile machine than any dedicated video-game device. So does Commodore. And the company is determined that this year the general public will be aware as well. The commercials for the 64 are planned for Saturday mornings and after-school hours—when the prime gaming market is watching. That market is going to get Commodore's message loud and clear: For sophisticated, exciting game play, the 64 remains a wise choice. The company feels confident that more than a few of those viewers—and their parents—will choose to buy a *computer* rather than a simple game machine.

So what do those consumers get if they buy a 64 or 128D rather than a cartridge-oriented game machine? They get video games, certainly. In fact, they get a larger and more varied selection of games than are available for, perhaps, any other machine. The fact that there are so many different games for the 64 has been on our minds a lot lately.

That's because we've been working on a new project here, *COMPUTE!'s Commodore 64 and 128 Buyer's Guide*. Our goal has been to assemble a valuable resource for all 64 and 128 owners. We set out to put together a picture of the Commodore software and peripherals universe—the programs and add-on hardware, or most of them anyway, that are available for the 64 and the 128. Such an encyclopedia, we felt, is long overdue.

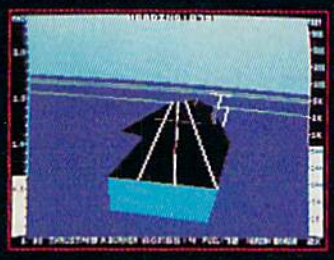
The number and variety of programs and peripherals available for the 64 and 128 are amazing, even to those of us who have followed these remarkable machines for five years now. There are hundreds of entertainment programs alone. In fact, we found half a dozen or so separate categories of entertainment software, each holding dozens of different programs. There are also hundreds of other programs in categories that include business applications, programmer's tools and user utilities, home applications, graphics and music packages, and educational software.

For Commodore 64 and 128 owners, there's never been such a variety of programs and add-on hardware. To help you sort out all that's available, look for our buyer's guide at your newsstand in late December. (There's additional ordering information in this issue on page 87.)

As we head into the new year, there are more reasons than ever to be pleased that you own a 64 or 128.

Keith Ferrell
Features Editor

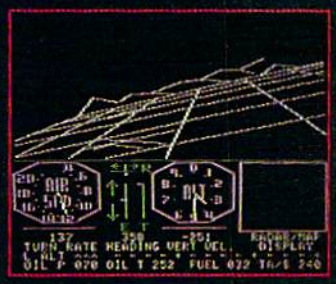
1987 - Expanding Scenery disk coverage; East Coast, Japan, & Europe



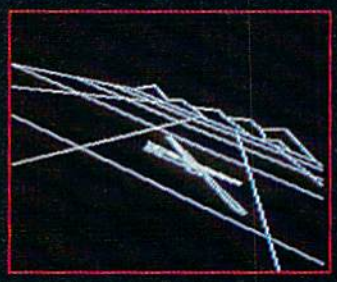
1985 - High-performance Jet flight simulator for the IBM, Commodore 64, and Apple II computers

1986 - Flight Simulator II for the 68000 computers

1982/1983 - Microsoft Flight Simulator & Flight Simulator II



1979 - 3D graphics applied to the original FS1 Flight Simulator for the new Apple II and TRS-80 computers



1977 - SubLOGIC's 3D graphics package in BASIC and M6800 Assembly Language

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We invite you to help us celebrate our first decade of success, and share in our anticipation of the next ten years to come. SubLOGIC tenth-anniversary promotional shirts and posters are available at your dealer or directly from SubLOGIC. See your dealer, or write or call us for more information.

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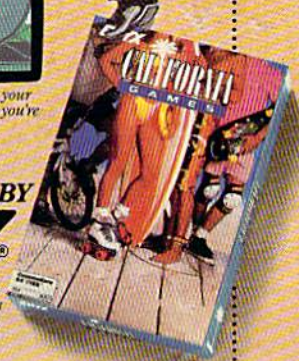

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Looking For A Database

I would like to find some software which will enable me to establish a record length of 82 characters containing eight fields of varying length. I'd like to be able to sort on some of these field and print lists or address labels. If you know of a supplier, I would appreciate having a name, address, and telephone number. I'm not a programmer and have to depend on software I can buy.

Norman B. Somers

There are several commercial database manager programs which would suit your needs. They allow you to define a record size; type in, modify, and delete information; search and sort; and print out the results. We regret that we can't recommend specific programs as being the best, and there are too many database programs to list here. If you ask other Commodore users (at a user group or on a bulletin board), you'll probably get many different suggestions about which database programs are good.

Redirecting Output

I own a 64, a Datassette, and a printer. My problem is that I don't know how to get a printout of a program. I know the printer does work because I use the *SpeedScript* word processor.

Daniel J. Bierzonski

The command you need is CMD (Change Main Device), which redirects computer output from the screen to whichever device you've indicated. After loading a program into memory, type these lines in direct mode:

```
OPEN 4,4: CMD 4: LIST
PRINT# 4: CLOSE 4
```

The first line opens channel 4 to device 4 (if you wish, you can add a secondary address to take advantage of special features built into your printer or interface). The CMD command tells the computer to send output to file 4 instead of to the screen. The listing then appears on your printer. The PRINT# command sends a blank line to the printer. This not only flushes the line buffer but also resets the main device to the screen. Then you close channel 4.

Listing The Directory

My question has undoubtedly been asked before. For the sake of us who haven't been Commodore owners very long, maybe you could answer it one more time. How do I get my Commodore 128 to operate the printer outside a program? For example, I get a directory up on the screen and I want a printout. Do I have to run a word processing program and then load the directory?

Linwood W. Crosby

Although you may be accustomed to typing DIRECTORY or CATALOG to see the directory, you need to load the directory into memory to print it out. Type the following lines in direct mode (with no line numbers):

```
LOAD "$",8
OPEN 1,4: CMD1: LIST
PRINT#1: CLOSE1
```

The first line loads the directory, which appears in memory in the form of a BASIC program. You can't run it, but you can list it. The second line opens channel one to the printer, changes the output device to channel one, and lists the program—or directory—that's in memory. See the previous question for more about how CMD works.

Protection And Copyrights

One of my friends has the habit of backing up the GAZETTE disks before running them, so that if something goes awry, he'll still have the original. To his surprise, upon trying to run his copy of the July 1987 disk, the drive couldn't seem to find anything but the directory! He found checksum errors on several of the tracks, apparently deliberately placed there to prevent duplication of the disk. How come? Have you run into problems with mass duplication of the disks or something?

My friends and I all subscribe to GAZETTE, and we usually divide the task of typing in the programs among ourselves and pool the results, so none of us will have to type all of them. Have we been wrong in doing this? We thought that as long as we each owned a copy of the magazine from which the programs were typed, we had your implied permission to use them, whether we individually typed them in or not.

Paul L. Baker

The GAZETTE Disk has never been copy-protected, and we don't have any plans to protect it in the future. It sounds like your friend received a disk that was either physically or magnetically damaged. We'll gladly replace damaged disks; call the customer service number for details.

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Formatting A Disk

I don't know how to save a program to a blank disk. I read somewhere that you must format a disk before you can save anything. If this is true, can you explain how to do it?

Ron Chan

Channel 15 is the disk command channel through which you send commands, read disk error messages, and communicate in general with the disk drive. There are three steps to formatting a disk: open the command channel, send the format command, and close the disk channel. Here's the long version:

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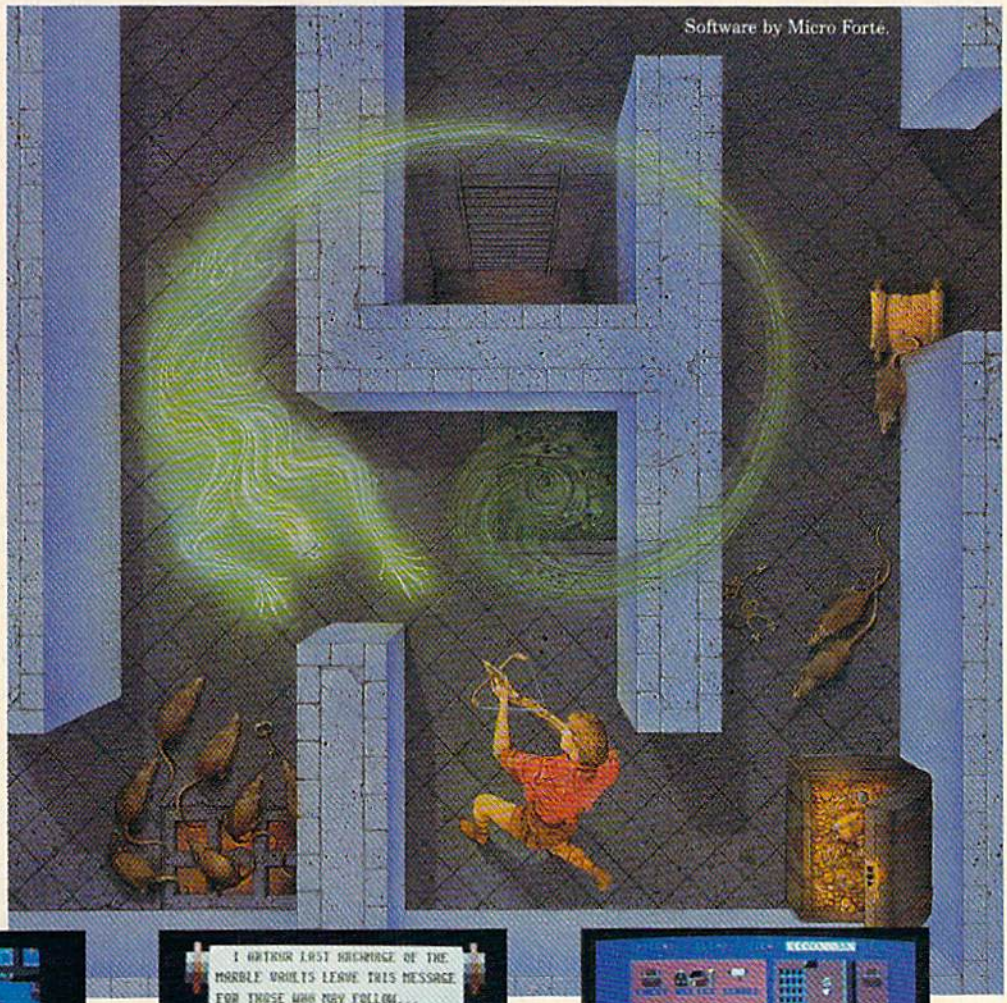

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```
OPEN 7,8,15
PRINT#7, "NEW0:diskname,id"
CLOSE 7
```

Type these lines in direct mode, with no line numbers. The OPEN command takes three numbers. The first is the logical file (it can be any number from 1 to 127). This file number is used later in the PRINT# and CLOSE statements. The second number is the device (disk drives can be device 8, 9, 10, or 11, but they're usually device 8). The third is the channel, which is 15 because we're sending a command. The PRINT# statement sends a string to an open channel. In this case, NEW tells the drive to format a new disk. Replace diskname *with the name you wish to give the disk, up to 16 characters long. The disk name is followed by a comma and the ID—a two-character identifier for the disk. It's a good practice to use different IDs for different disks. The CLOSE command closes the open file. For a brand new disk, the ID is required. If the disk was previously formatted, you can save some time by omitting the ID.*

Here's a shorter way to format a disk. The name and ID are included on the same line as the OPEN, and NEW *is abbreviated to* N:

```
OPEN 15,8,15,"N0:diskname,id"
CLOSE 15
```

FORTRAN And COBOL For The 128

I am studying FORTRAN programming at school, and I'd like to be able to run my own programs at home. The problem is that I can't find any FORTRAN compilers for my 128. Any help you can give me in this area will be greatly appreciated.

Stephen Webber

I am studying electrical engineering at a university that uses FORTRAN. I own a 128 and a 1571, and I know that my system is capable of handling FORTRAN in its CP/M mode. Is there a FORTRAN compiler available that I can use with 128 CP/M?

Rauf Aslam

I own a Commodore 128 computer, and I am looking for a good professional COBOL compiler to work in the CP/M mode. I have read many magazine articles that tell me there is a lot of CP/M software available, but I can't seem to find any. I've called Borland, the makers of *Turbo Pascal*, and they say they don't make a COBOL compiler. Can you please tell me where I can get a COBOL compiler for the 128's CP/M mode?

Jeff Teel

Ellis Computing offers a CP/M version of FORTRAN IV, called Nevada FORTRAN, *that works very well with the 128's CP/M. You can use* Nevada FORTRAN *with a one-drive system, but you'll have to do some disk swapping. You can order* Nevada FORTRAN *for $49.95 from Ellis Computing, 5655 Riggins Ct., Suite 10, Reno, NV 89502.*

Another CP/M FORTRAN compiler for the 128's CP/M mode is Microsoft's FORTRAN-80. FORTRAN-80 *is available for $39 from Public Domain Software Copying, 33 Gold St., New York, NY 10038.*

There are two COBOL implementations available for the 128—one for the CP/M mode and one for the 128 mode. Ellis Computing sells its own CP/M Nevada COBOL *compiler, based on the ANSI-74 standards, for $49.95 (see address above).*

There is also a COBOL interpreter available for the 128 in its native mode from Abacus Software. COBOL 128 *is a COBOL programming environment, complete with editor, interpreter, and debugger. You can order it from Abacus Software, P.O. Box 7219, Grand Rapids, MI 49510, for $39.95.*

Please note that in the 64 and 128 worlds, most language implementations come with an integrated editor. This is not true for CP/M, however. You'll need a CP/M editor to create source files for your compiler to translate. The line editor that comes with the CP/M system (ED.COM) is adequate for simple tasks, but for heavy-duty editing, you'll want a more sophisticated program.

Here are some other sources of CP/M software:

First Osborne Group (FOG)
P.O. Box 3474
Daly City, CA 94015

Poseidon Electronics
103 Waverley Place
New York, NY 10011

Micro Cornucopia
P.O. Box 223
Bend, OR 97709

Custom Messages On The 64

I have been looking for a program I believe was published in COMPUTE! or COMPUTE!'s Gazette. The program customized some of the 64's messages. It also allowed you to change the spelling of BASIC's commands. Since I don't remember which magazine it was in, or when it was published, can you help?

Gregory Bushta

All of the 64's messages are stored in Read Only Memory (ROM). To change a message, you must copy ROM to underlying RAM, switch out ROM, and then POKE the ASCII characters for your new messages over the old ones. The first step, copying BASIC ROM to RAM is simple:

```
FOR I=40960 TO 49151:POKE
I,PEEK(I):NEXT
```

This is a long FOR-NEXT loop and may take half a minute. Next, switch out BASIC ROM:

```
POKE 1,PEEK(1) AND 254
```

Now that the BASIC interpreter is working out of RAM, enter and run the following program:

```
10 MS$="OK. ":MA=41848
20 FOR I=1 TO LEN(MS$):POKE
   MA+I-1,ASC(MID$(MS$,I,1)):NEXT
```

MS$ is the new message, and MA is the address of the original message in memory.

When run, the two-line program above changes the familiar READY prompt to an OK. As long as you know the address of a message in memory, you can change it. Because messages are stored sequentially (one right after the other), your new messages must be less than or equal to the original message in length. If the new message is longer than the original, it will "spill" over, destroying the start of the next message in memory.

Using the same technique, it's possible to change the spelling of BASIC commands. Because of the way BASIC searches through the memory during its tokenization process, you should always replace a BASIC command with a command of the same length. Also, unlike the READY message, BASIC commands and error messages are stored with the last character's high bit set (the ASCII value plus 128). That's how the BASIC interpreter detects the end of messages. So, to make the program above work for BASIC commands and error messages, add this line:

```
30 POKE MA+LEN(MS$)-1,ASC
   (RIGHT$(MS$,1))+128
```

Now, try some of the following experiments.

Change RUN to GO!:
```
10 MS$="GO!":MA=41157
```

Change STOP to HALT:
```
10 MS$="HALT":MA=41183
```

Change FORMULA TOO COMPLEX to I'M CONFUSED:
```
10 MS$="I'M
   CONFUSED":MA=41709
```

As you can see, the key to changing BASIC messages is knowing the message's original address in ROM. To find the addresses of other messages in memory, run this program:

```
10 C=255:PRINT "ADDRESS
   MESSAGE"
20 FOR AD=41118 TO 41767
30 IF C>127 THEN PRINT:PRINT AD,
40 C=PEEK(AD):PRINT CHR$(C AND
   127);
50 NEXT
```

Lotto Mania

I recently wrote a program to pick lottery numbers at random for our state lottery, but I'm having a problem with it. In my state, there are two major lottery games. One requires you to choose six different numbers from 1 to 44; the

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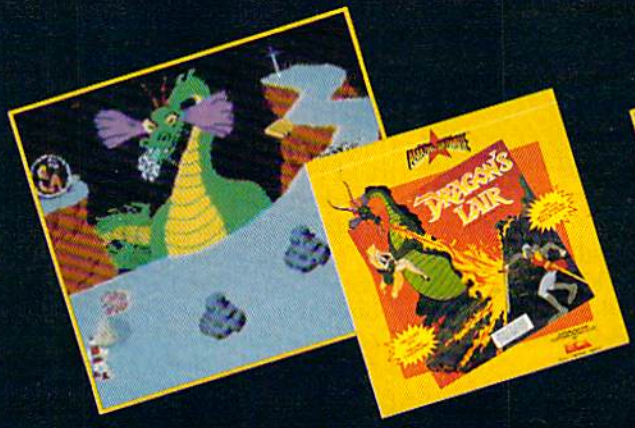

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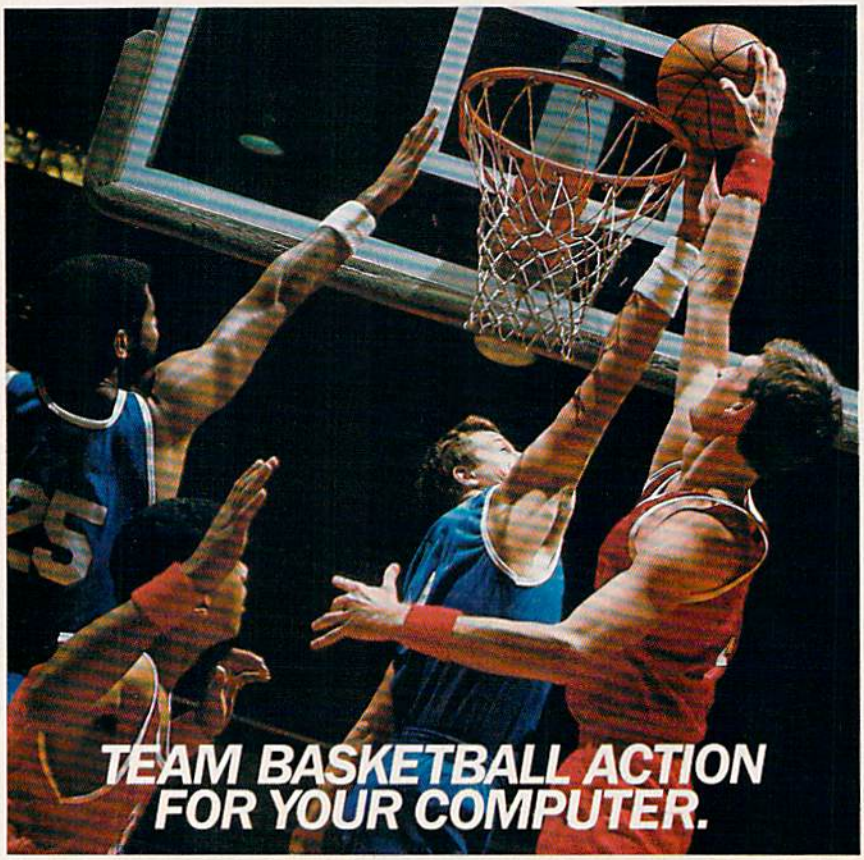

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other, seven numbers from 1 to 38. Can you show me how to do this?

Mark Pacetti

Imagine writing the numbers 1–44 on 44 slips of paper, tossing them into a box, mixing them up, and drawing six out. That would be one way to randomly select six numbers, with no duplicates.

The following program randomly picks six numbers in the range 1–44, using the paper-in-the-hat technique. To have it choose seven numbers from 1 to 38, set LIMIT and NUMBERS to 38 and 7, respectively, in line 10.

```
QH 10  LIMIT=44:NUMBERS=6:X=RND
       (-TI)
HQ 20  DIM A(LIMIT)
QM 30  FOR I=1 TO LIMIT:A(I)=I:
       NEXT I:REM ASSIGN VALUES
        TO A()
CD 40  FOR I=1 TO LIMIT:T=A(I):
       X=INT(RND(1)*LIMIT)+1::A
       (I)=A(X):A(X)=T:NEXT I
PB 50  FOR I=1 TO NUMBERS:PRINT
        A(I),:NEXT I
```

After seeding the random number generator in line 10, we create a numeric array A containing the numbers 1–44 in line 30. If you printed the first six numbers at this point, they would always be 1–6. Line 40 shuffles the array. Every number in this array is swapped randomly with another number in the array. In line 50, the first six numbers in the scrambled array are printed.

This programming technique could just as easily be adapted to select playing cards from a deck at random. There are 52 cards in a standard deck. Each card could be represented by a number from 1 to 52. So, to pick six distinct cards from the deck, just change LIMIT in the above routine to 52.

Two Single Drives Are Not A Dual Drive

I have a 128 with a 1571 set up as device 8, and a 1541 set up as device 9. When I try to back up a disk using **COPY D0 TO D1** or **BACKUP D0 TO D1**, it does not work correctly. Can you tell me why?

Jack Craig

Your problem is that both the COPY and BACKUP commands work with dual *disk drives only. Although the name may be misleading,* dual drive *does not mean* two drives.

In your current setup, each of your disk drives is considered a separate device—one is device 8, and the other is 9. Because each device contains only one drive, both drives are considered drive 0. A dual drive, on the other hand, is considered one device with two drives, numbered 0 and 1. Physically, dual drives look like two drives in one box. Unfortunately, without changing the ROMs inside the 1541 or 1571, there is no way to make two

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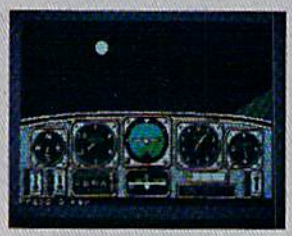

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separate drives into one dual drive: You just can't convince one of your disk drives to take on the role of drive 1.

The two commands COPY and BACKUP are really held over from the days of the PET, when dual drives were common. Examples of dual drives are the 2040, 3040, 4040, and 8050. Each increase in model number reflects the increase in DOS version, mechanical improvement, and, in some cases, free disk space. These drives, however, are no longer available from Commodore. And even if you could find one, they are not compatible with the Plus/4, 16, 64, or 128 unless you have the proper IEEE interface cable.

If you want to take advantage of both your drives, there is an exellent program entitled UNICOPY, found on the 1571 Test/Demo disk that came with your disk drive. This program copies disks or files using two disk drives.

Vanquishing Noise

I have a problem downloading files from bulletin boards. I don't know which downloading protocol to select, and I don't know how they work. What is the best downloading protocol? I have a 64 and a 1660 modem.

Paul Carey

First, a few words about why downloading protocols are necessary and how they work. Imagine that you're talking to someone. If the two of you are standing ten feet apart in a quiet place, both of you will hear clearly. If you're 200 feet apart, you probably won't. In a crowded room, other conversations and background noise could interfere with your own conversation.

When you're downloading a program, fading signals, static, noise, and glitches in transmission or reception can introduce errors in the file you're downloading. A success rate of 19,999 out of 20,000 isn't good enough. Just one faulty character can spell the difference between a program that works and one that doesn't. Transfer protocols were invented to thwart such problems.

A downloading protocol defines a standard method for accurately transferring data between one computer and another. The sending computer transmits a block of bytes followed by a checksum, which is the result of adding, multiplying, or otherwise manipulating the data from the block just sent (both programs use the same formula). The receiving computer double checks the data against the checksum. If, for some reason, the checksums don't match, the receiving computer sends a message that means try again. *Otherwise, it sends a message that means* send the next block. *The idea is very similar to the checksums used in "Automatic Proofreader" and "MLX" programs in COMPUTE!'s Gazette.*

Within the microcomputer world, the most popular downloading protocol is Xmodem, which is sometimes called Christenson protocol (after its inventor, Ward Christenson). You may encounter two variations of Xmodem: the original Checksum and the newer Cyclic Redundancy Checksum (CRC). The CRC version of Xmodem is slightly better than the Checksum version, but both are reliable. Many terminal programs (and BBSs) start by checking for CRC and then switch to Checksum if CRC fails.

A second popular file transfer protocol is Punter, named for its creator, Steve Punter. Like Xmodem, it comes in two versions. Punter protocol is Commodore-specific.

Most national telecommunications services (including CompuServe, GEnie, Delphi, and The Source) support Xmodem transfers. QuantumLink uses its own proprietary protocol and terminal program. Most BBSs support either Xmodem or Punter. Occasionally, you'll run across other protocols, but Xmodem and Punter are the two most popular.

Which protocol is the best? There are ways to prove mathematically that certain systems are more accurate and less likely to fail. The CRC version of Xmodem is slightly better than the original checksum version, for example. Most of the time, the question of accuracy is moot, however. The best protocol to use is the one the sysop of the BBS offers. If you're on an Xmodem board, that's the protocol to use.

Duplicating Disk Errors

While saving or editing data with a commercial database, I sometimes suddenly get a 20, READ, 4, 1 error (I'm not sure about the last two numbers). I have no idea how to read this information or how to correct the error. How can I fix it or avoid this error? Right now I am making backups after 30 minutes of entering data. Then when I run into the error, I use a commercial disk-copying program and start over. Unfortunately, I lose up to 30 minutes of work.

Jack D. Devine

The disk error 20, READ, 4, 1 *means you have an read error number 20 on track 4, sector 1. (For most disk errors, the last two numbers indicate the track and sector where the disk failed.) It's likely that your disk has been damaged, either accidentally or on purpose.*

Because it's illegal to sell (or give away) copies of copyrighted programs, some software companies deliberately put errors on their disks and then have the program check for the existence of a bad sector. This prevents some people from making copies. But it's legal to make personal backups for your own use, so there are copying programs that detect and faithfully reproduce most disk errors.

Unfortunately, the disk-copying program you used will duplicate an entire disk, including errors. Each time you back up the disk, you're copying the bad sector. It's inevitable that you'll see the error 20 again and again, as long as you continue to make copies of the bad disk.

The read error might be a result of a physically damaged disk, in which case you should throw out the bad disk. Or, if you copied the original program disk, it may be that the error was part of the copy-protection scheme. When using commercial software such as a database, you shouldn't save the data to the same disk as the program. Format a new disk and use it for data only.

You'll need to copy the data files over to a new disk without copying the bad sector. If the database program has a backup option (or if it saves the entire file), you could do it that way. A file-copying program—one that doesn't duplicate entire disks—might work, too.

The Shift Flag

In a program I'm writing, I need to detect when the CTRL and Commodore keys are pressed. Is there some location I can PEEK for this?

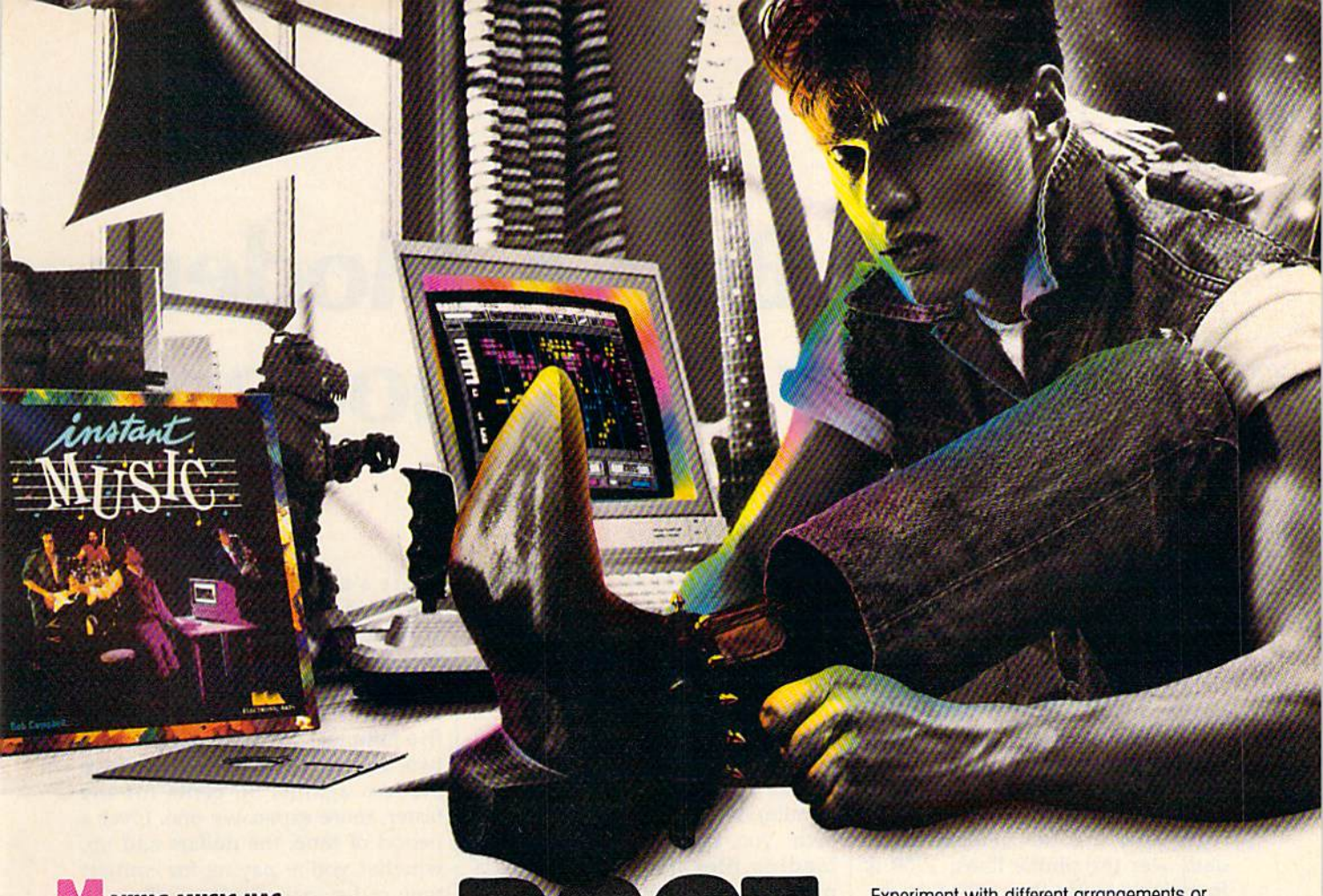
Eric Campbell

All eight-bit Commodore machines have an address known as SHFLAG (location 211 on the 128, 653 on the 64, and 1347 on the Plus/4 and 16). SHFLAG tells you when one or more of the shift keys (SHIFT, CTRL, or Commodore) is being pressed. Ordinarily, this address contains a zero. A value of 1 signifies that one of the two SHIFT keys—or the SHIFT LOCK key—is being pressed; a 2 indicates the Commodore logo key is down; and a 4 tells you the CTRL key is being pressed. On the 128, this address detects two additional keypresses. An 8 indicates the ALT key is pressed; a 16 means CAPS LOCK is down.

The values in SHFLAG are cumulative. For example, if you press the CTRL and Commodore keys at the same time, PEEKing SHFLAG returns a 6.

The following short program demonstrates this effect. Run it and then press different shift keys, alone or in combination. The value in SHFLAG, depending on the keys you press, will print repeatedly to the screen.

```
RF 10 SHFLAG=653:REM SHFLAG=21
      1 ON THE 128, 1347 ON TH
      E PLUS 4/16
FA 20 PRINT PEEK(SHFLAG):GOTO2
      0
```



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How To Buy A Modem For Your Commodore

Todd Heimarck, Assistant Editor

Ask yourself two questions before buying a modem (modulator/demodulator). First, how much do you want to spend? Second, do you want a Commodore-compatible modem or a standard RS-232 modem?

Almost all 300-baud modems are priced under $100, while 1200-baud modems can cost as much as $250 or more. (The *baud rate* measures how fast the modem sends data over the phone lines; 1200 is four times faster than 300.) At the low end of the price spectrum, you may find inexpensive modems for $20 (300 baud) or $90 (1200 baud). Discount modems are often less expensive because a company has gone out of business, or because a certain line has been discontinued. The quality of such modems is not necessarily any worse, but the warranty (and manufacturer's support) might be lacking.

A Commodore-compatible modem plugs directly into the modem port on the back of a 64, 128, or other eight-bit Commodore computer. While a standard RS-232 modem will work as is with most microcomputers—say, an IBM or Amiga—it requires a separate interface if you're on a 64 or 128.

Extra Charges

If price is the most important consideration, you might think that a 300-baud modem is obviously less expensive than a 1200-baud modem. But that's not necessarily true. Over a period of months, you might actually save money if you choose 1200 baud.

The baud rate of a modem tells you how fast it sends data over the phone lines. To be technically accurate, we should talk about *bits per second* (bps) instead of baud. In practice, however, the two terms are used interchangeably. A 1200-baud modem is four times faster than a 300-baud modem: roughly 120 bytes per second (7K per minute) versus approximately 30 (2K per minute). When you use a faster modem, you spend less time downloading files. (*Downloading* is a process where you receive a program or other file. *Uploading* is the opposite: sending a program to another computer.)

Once you buy a modem, you'll be calling local bulletin board systems (BBS's) or national telecommunications services, such as CompuServe, QuantumLink, GEnie, Delphi, and The Source. If you live in a medium-sized or large city, you'll probably be able to find at least a few BBS's you can call free. They don't have to be Commodore boards; you can use a 64 to connect with any type of BBS.

If you call BBS's outside of your area code, the long-distance charges will be charged at the usual rate (the telephone can't tell if you're talking or telecommunicating, and there's no extra charge for using a modem). If you join a national service, you'll generally be given a local phone number to call. You don't pay for a long-distance connection to the telecommunications service, but you usually pay a connect fee that's based on the time you spend online.

Let's say you're paying a flat connect fee of $6 per hour, which translates to $1 every ten minutes. There's an adventure game you want to download from the national service, but it's fairly long. At a speed of 300 baud, it would take 20 minutes, but at 1200 baud, the file transfer is four times faster—only five minutes. The price difference is two dollars for the less expensive modem against 50 cents for the faster, more expensive one. Over a period of time, the dollars add up, whether you're paying for connect time or for long-distance calls.

In addition to the programs that are available, most BBS's and national services also have a message area where you can leave private notes to other members or join in public discussions. If you read messages and compose replies online, 1200 baud isn't any faster than 300 baud. The speed limit is your typing ability. Even if you type an incredible 100 words per minute, you're still only sending bits at the relatively slow rate of about 50 baud. A message that takes you five minutes to write will take five minutes to write, regardless of how fast the modem is running. It's possible, however, to write messages offline with a word processor, and then electronically mail them (at either 300 or 1200 baud), in which case 1200 baud would be faster and less expensive.

The initial price of the modem is a one-time expense. If you choose a less expensive 300-baud model and spend a lot of time downloading, you may end up paying more for connect fees and long-distance bills. A 1200-baud modem isn't always more economical, however. If you limit your calls to local BBS's or

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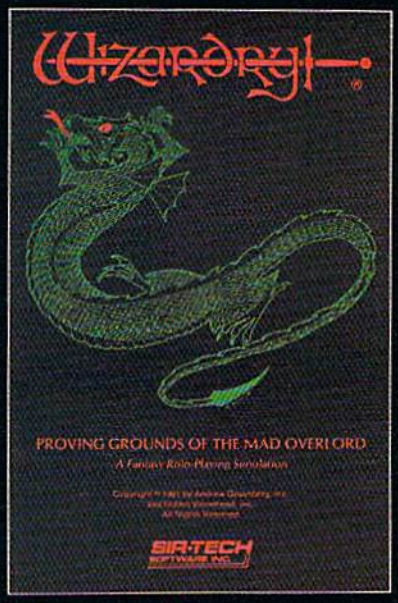

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spend most of your time reading and replying to messages, 300 baud wouldn't cost any more than 1200.

Nearly every 1200-baud modem can operate at either speed. If you call a BBS that's 300 only, some 1200-baud modems will automatically slow down to 300. With others, you'll have to flip a switch or send a command from the terminal program.

Compatible Or Not?

In the microcomputer world, the accepted standard for modem cables and connectors is called *RS-232*. The RS-232 port on a 64 or 128 does not operate according to the standard. The voltages are different. To use a standard modem with a Commodore, you must hook up a Commodore RS-232 interface that handles the voltage conversion. The interface adds a few dollars ($20–$50) to the price of the system.

Certain modems, especially Commodore's own brands, use Commodore's nonstandard RS-232 configuration. In the accompanying buyer's guide, if the modem is listed as *Commodore-compatible*, it means you don't need an additional interface. Such modems plug directly into the modem port.

Standard RS-232 modems work on almost all computers; Commodore-compatible modems work only on eight-bit Commodores (VIC, 64, and 128, but *not* the Amiga). If you think you might someday buy another computer—an IBM, Amiga, ST, Macintosh, or whatever—or if you already own a second computer, you should consider buying a standard Hayes-compatible RS-232 modem. If you're paying $200 for a good modem, you might as well insure that it's compatible with other computers you may own in the future. If a new computer is not on the horizon and you're interested in saving money, Commodore-compatible modems are generally less expensive.

Terminal Programs

Disregarding the difference between 300 and 1200 baud and the voltage difference between Commodore and RS-232 plugs, most modems have very similar features. A modem's basic task is to convert data from the computer into whistling tones that travel over the phone lines, and vice versa.

The single factor that makes telecommunications easy or difficult for the new user is the terminal program, which handles input and output from the modem. A bare bones terminal program does two things: It figures out which characters you typed, sending them out over the phone lines, and it figures out the incoming characters, printing them on the screen. Most terminal programs also have features for dialing numbers, picking up the phone, hanging up, translating between Commodore ASCII and true ASCII, and so on. A good terminal program also supports one or more transfer protocols, such as Xmodem or Punter. (A *transfer protocol* is a way to insure that a session of uploading or downloading is error free.)

When you buy a modem, you'll often receive a free terminal program in the package, which means you can start telecommunicating immediately. Companies that manufacture modems are not always very good at writing software. The terminal program you receive free may be good or bad. But that doesn't really matter, because there are many excellent terminal programs available commercially and in the public domain. Public-domain terminal software can be found at local user groups, on BBS's, and on national services. In addition to the program, be sure to download any documentation files that explain the various commands. If you happen to receive a less-than-adequate terminal program, you can usually use it to download a more powerful, full-featured program.

Before you buy a modem, consider the two questions of price and compatibility. Commodore-compatible 300-baud modems are less expensive, but a standard RS-232 1200-baud modem might save money in the long run. After you've decided on a modem, try out a few terminal programs to see which one best suits your needs. You'll soon be calling BBS's and telecommunications services, downloading new programs, and meeting new people.

Terms And Definitions

Here's a short explanation of the terms used in describing modems.

Compatibility and Interface. Commodore-compatible modems plug directly into the computer through the user port. Modems with an RS-232 port connector require an interface, since Commodore computers have a nonstandard RS-232 port.

Baud Rate. Baud rate measures the speed of transmission in bits per second. Normally, the higher the baud rate, the more the modem will cost initially.

Auto-answer and Auto-dial. Auto-answer modems can automatically answer incoming calls and receive data. Auto-dial modems can automatically dial a telephone number and connect to another computer.

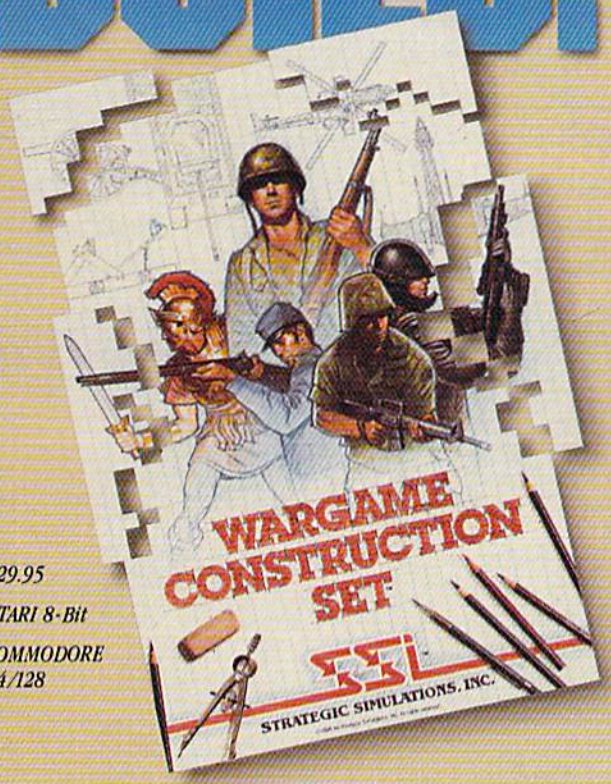
Self-test. Can the modem check itself to see if everything is working and connected properly?

Carrier Detection Indicator. An indicator, usually in the form of a light-emitting diode (LED), this signals when the modem has connected or disconnected with another computer.

Power Supply and Cables/Connectors. Modems derive their power from a standard AC outlet, an internal battery, or directly from the computer. Some modems are packaged with the cables or telephone cords needed to hook it up to the computer.

Terminal Software. Some modems have telecommunications software included in the package. In the Buyer's Guide, *yes* means there is Commodore-compatible terminal software; *MS-DOS* means the software included will operate only on MS-DOS machines; and *no* signifies that there is no software included.

BUILD.



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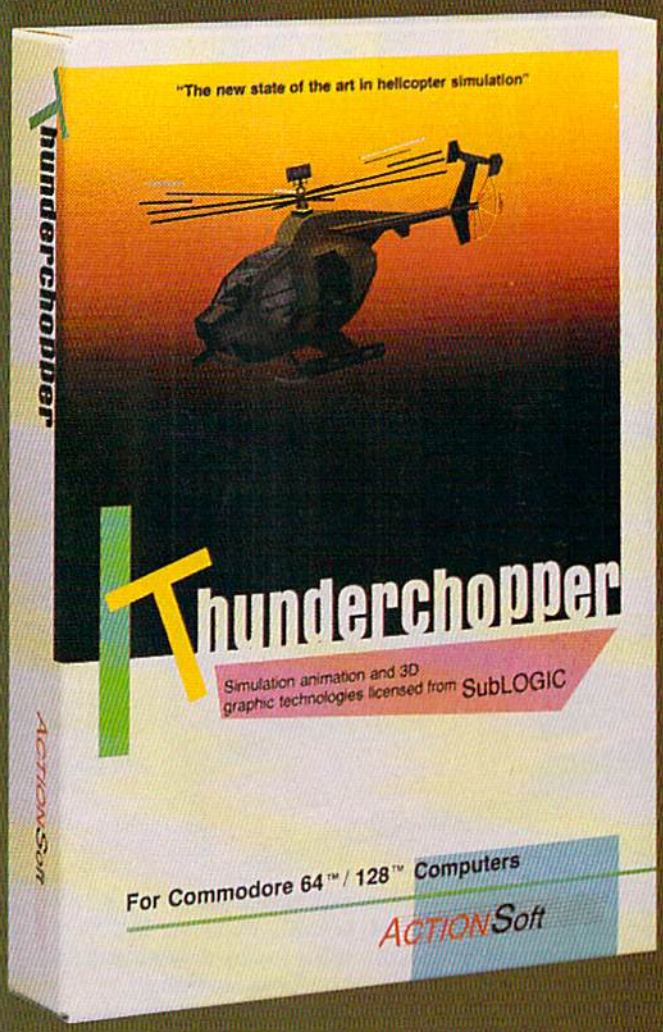
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A Buyer's Guide To Modems

Modem	Manufacturer	Compatibility	Interface Required?	Baud Rate	Auto-Answer	Auto-Dial	Self-Test	Carrier Detection Indicator	Power Supply	Cables/ Connectors Included?	Terminal Software Included?	Warranty	Price	Comments
Expert 12e	Advanced Computer Technology	RS-232	yes	300/1200	yes	yes	yes	LED	battery	no	no	2 years	$109	
Expert 24e	Advanced Computer Technology	RS-232	yes	300/1200/2400	yes	yes	yes	LED	battery	no	no	2 years	199	
Volksmodem 12	Anchor Automation, Inc.	64/128	no	300/1200	yes	yes	no	screen	external	no	no	5 years	199	
Volks 6420	Anchor Automation, Inc.	64/128	no	300	yes	yes	no	screen	host computer	yes	yes	5 years	99	AutoCom Software
Volks 6480	Anchor Automation, Inc.	64/128	no	300/1200	yes	yes	no	screen	host computer	yes	yes	5 years	199	AutoCom Software
Anchor 1200E	Anchor Automation, Inc.	RS-232	yes	300/1200	yes	yes	no	screen	external	no	no	5 years	189	
Anchor 2400E	Anchor Automation, Inc.	RS-232	yes	300/1200/2400	yes	yes	no	screen	external	no	no	5 years	239	
Mini Modem C	Aprotek	64/128	no	300/1200	yes	yes	no	LED	host computer	telephone cable	yes	1 year	125	Hayes compatible
Mini Modem H	Aprotek	RS-232	yes	300/1200	yes	yes	no	LED	AC	telephone cable	no	1 year	125	Hayes compatible
1660 Modem	Commodore Business Machines, Inc.	64/128	no	300	yes	yes	no		host computer	plugs into computer	yes	90 days	49.95	
1670 Modem	Commodore Business Machines, Inc.	64/128	no	300/1200	yes	yes	no		host computer	plugs into computer	yes	90 days	149.95	Hayes compatible
AV 2400	Everett/Charles Marketing	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	no	no	2 years	290	
Avatex 1200HC	Everett/Charles Marketing	RS-232	yes	300/1200	yes	yes	yes	LED	AC	no	no	2 years	160	Hayes compatible
Evercom 24E	Everex Systems Inc.	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	yes	MS-DOS	1 year	399	Speaker phones, sliding volume control
Smartmodem 300	Hayes Microcomputer Products	RS-232	yes	300	yes	yes	yes	LED	AC	no	no	2 years	199	
SmartLink 1200	Hololink Technology Corp.	RS-232	yes	300/1200	yes	yes	yes	LED	AC	AC adapter and telephone cord	MS-DOS	2 years	179	
SmartLink 2400	Hololink Technology Corp.	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	AC adapter and telephone cord	MS-DOS	2 years	299	
Turbo 2400	Incomm	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	no	no	5 years	325	MNP level 3 error correction
Clear Signal 212A	Inmac	RS-232	yes	300/1200	yes	yes	yes	LED	AC	some	no	1 year	289	Part No. 8019
Clear Signal 300 Baud Modem	Inmac	RS-232	yes	300	no	no	yes	LED	AC	some	no	1 year	99	Part No. 8127
Super Modem 1200	Mitsuba	RS-232	yes	300/1200	yes	yes	yes	LED	AC	no	no	1 year	150	Metal case
Super Modem 2400X	Mitsuba	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	no	no	1 year	299	
J-Cat	Novation, Inc.	RS-232	yes	300	yes	yes	yes	LED	AC	yes	no	1 year	149	
1200XE	Novation, Inc.	RS-232	yes	300/1200	yes	yes	yes	LED	AC	yes	MS-DOS	2 years	299	
Parrot Modem	Novation, Inc.	RS-232	yes	300/1200	yes	yes	yes	LED	host computer	yes	no	2 years	135	
ProModem 1200	Prometheus Products, Inc.	RS-232	yes	300/1200	yes	yes	yes		AC	telephone cable	no	2 years	349	512K buffer

Modem	Manufacturer	Compatibility	Interface Required?	Baud Rate	Auto-Answer	Auto-Dial	Self-Test	Carrier Detection Indicator	Power Supply	Cables/Connectors Included?	Terminal Software Included?	Warranty	Price	Comments
ProModem 1200G	Prometheus Products, Inc.	64/128	no	300/1200	yes	yes	yes		AC	telephone cable	no	1 year	249	
ProModem 2400G	Prometheus Products, Inc.	64/128	no	300/1200/2400	yes	yes	yes		AC	telephone cable	no	1 year	349	
PC 212A/1200E	Qubié	RS-232	yes	300/1200	yes	yes	no	LED	AC	no	no	1 year	99	
PC 212A/2400E	Qubié	RS-232	yes	300/1200/2400	yes	yes	no	LED	AC	no	no	1 year	189	
Intec 1200c	Standard PC Industries	RS-232	no	300/1200	yes	yes	no	LED	AC	yes	yes	2 years	99.99	Modified port for use with 64/128
Intec 2400c	Standard PC Industries	RS-232	no	300/1200/2400	yes	yes	no	LED	AC	yes	yes	2 years	169.99	Modified port for use with 64/128
Supra Modem 2400CM	Supra Corporation	64/128	no	300/1200/2400	yes	yes	yes	LED	AC power adapter	yes	yes	1 year	219.95	Limited smart terminal software
Tm 110	Tandata Marketing, Inc.	VIC-20, 64/128	yes	300	no	yes	no	screen	AC	no	no	90 days	228	ROM cartridge includes color terminal emulator, cables, and software, and is sold separately
Worldport 1200	Touchbase System	RS-232	yes	300/1200	yes	yes	no	LED	battery	no	no	2 years	199	Portable
Worldport 2400	Touchbase System	RS-232	yes	300/1200/2400	yes	yes	no	LED	battery	no	MS-DOS	2 years	359	Portable
Sportster 1200	US Robotics, Inc.	RS-232	yes	300/1200	yes	yes	yes	LED	AC	telephone cable	no	2 years	149	
Sportster 2400	US Robotics, Inc.	RS-232	yes	300/1200/2400	yes	yes	yes	LED	AC	telephone cable	no	2 years	249	
UDS-103JLP	Universal Data Systems	RS-232	yes	300	yes	no	no	LED	telephone line	telephone cable	MS-DOS	1 year	165	
UDS-212ALP	Universal Data Systems	RS-232	yes	300/1200	yes	no	no	LED	telephone line	telephone cable	MS-DOS	1 year	195	
Ven-Tel 1200+	Ven-Tel Modems	RS-232	yes	300/1200	yes	yes	yes	screen	AC	no	no	5 years	349	

Modem Manufacturers and Distributors

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Aprotek, 1071-A Avenida Acaso, Camarillo, CA 93010

Commodore Business Machines, 1200 Wilson Dr., West Chester, PA 19380

Everett/Charles Marketing, 6101 Cherry Ave., Fontana, CA 92335

Everex Systems, Inc., 48431 Milmont Dr., Fremont, CA 94538

Hayes Microcomputer Products, P.O. Box 105203, Atlanta, GA 30348

Hololink Technology Corporation, 151 S. 9th Ave., Suite K, City of Industry, CA 91746

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Standard PC Industries, 21751 West Nine Mile Rd., Suite 141, Southfield, MI

Supra Corporation, 1133 Commercial Way, Albany, OR 97321

Tandata Marketing Ltd., Albert Road North, Malvern, Worcs WR14 2TL, England. Distributed by U.S. Telecom Inc., 315 Greenwich St., New York, NY 10013

Touchbase Systems, 160 Laurel Ave., Northport, NY 11768

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Universal Data Systems, 5000 Bradford Dr., Huntsville, AL 35805

Ven-Tel Modems, 2121 Zanker Rd., San Jose, CA 95131

Going Online

Getting In Touch With Some Of The Best Commodore Bulletin Boards

Tom Netsel, Assistant Features Editor

There's a whole world of computer entertainment and education just a telephone call away. Have your Commodore dial an electronic bulletin board and you can read messages, check items for sale, and even play games with a computer across town or across the country. But the best part is all the free software you can have for the asking.

GAZETTE surveyed the Commodore telecommunications community to find out which BBS's were considered the finest overall. Here's how to go online—with a list of the boards you might want to try first.

Read any good bulletin boards lately? If you're restricting yourself to the traditional cork-and-thumbtack bulletin boards in your neighborhood, you're missing out on a lot. Even a bulletin board at a library—which at least is close to material you can check out and take home for perusal at your leisure—can't compare with the world of electronic bulletin board systems (BBS's). The boards you reach with your computer can put you in touch with interesting people, innovative and outlandish ideas, and fine art. And, perhaps best of all, BBS's are loaded with software you're welcome to download and use.

Some BBS's are run by computer stores or user groups, but the majority are set up by individuals called system operators—*sysops*—who run the boards as an extension of their interest in computers. Sysops set up hardware and software to answer the phone and allow your computer to contact theirs. BBS programs actually run the system—the sysop need not even be at home for callers to browse through his or her board's offerings.

The ability to receive (download) free programs is the most popular reason for calling bulletin boards, but most boards offer more than just programs. Like a conventional bulletin board at a supermarket, most BBS's will let you read and reply to messages posted by other users and leave messages of your own. On a BBS, however, you can leave a note for a specific person and no one else can read it. You can play online games, add creative comments to ongoing epics being written by other callers, order products for sale, or chat with the sysop via your keyboard. A BBS can even help you get a date.

What's In A Name?

A board's name often provides insight into its character. Users who call Loonie Land probably do not leave messages questioning the meaning of life. If you call Lawyers Linked in New York City there is a good chance you will see items pertaining to the bar, but not the same type of bar featured at The Wine Rack in Arlington, Virginia. And Bif's Bar & Grill in Lodi, California, is completely different from either of them. Comm-Adorers BBS, Flashbacks, the Postman's BBS, the Dark Side, Dragon's Lair, and Ground Zero are the names of just a few of the more than 1000 BBS's around the country.

Modems

In order to contact or log on to a bulletin board system, you will need a modem. Calls to several Commodore user groups revealed the number of members who own modems ranged between 11 and 68 percent. Like the cost of other computer hardware, modem prices have fallen dramatically in the past few years. Features that once cost several hundred dollars can now be found on models selling for a fraction of that amount. (For more information about modems, see "How to Buy a Modem for Your Commodore" elsewhere in this issue.)

Software

In addition to a modem, you'll need telecommunications software before you can start calling BBS's. These *terminal programs* usually come with your modem, but quality may range from great to terrible. After you become familiar with telecomputing, you'll be able to decide whether another terminal program might better suit your needs.

Many excellent terminal programs are in the public domain and can be found on bulletin boards. Copies also can be obtained from Commodore user groups.

Logging On

When you call a BBS, you'll be greeted by a message that tells you the name of the board and something about it. Then you may be asked for your name and a pass-

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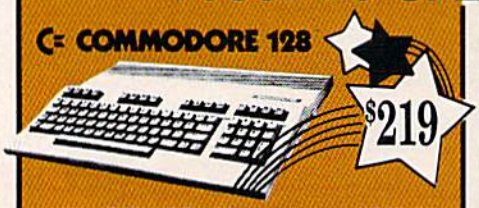

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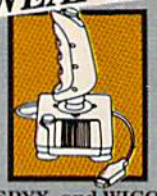

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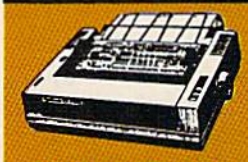

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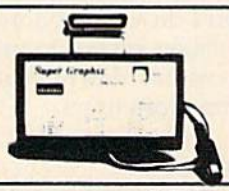

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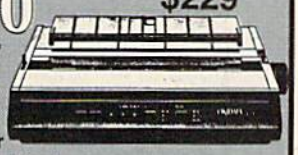

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word. If it's your first call, you won't have a password. The BBS should tell you to type the word *New* or *Guest* or something similar until you have registered with the system.

Some boards let new users browse through their offerings without asking them to register. If you like what you see, you can register before hanging up. Other boards want your name and address right away. Some callers like to use pseudonyms, or handles, but sysops generally prefer knowing who is on their board. So give your real name when you register. The system may later permit you to use a handle.

In most cases, you will be asked to select a password. This secret word will let you log on to the system in the future, permitting you to receive and delete your personal messages.

Uploading And Downloading

BBS's hold lots of information that you may want to keep, as well as software you may want to try. Your terminal software should allow you to capture and save the information that appears on your screen. At 1200 bits per second (bps) the text may fly across the screen faster than you can read. Don't try to keep up. By capturing the information in a buffer, it can be saved and sent to your monitor or printer for reading later.

Information about capturing text or downloading a program can be found in the documentation supplied with your terminal software. The BBS usually provides other downloading information you may need. There usually is a directory of all the games, utilities, telecommunications programs, and other programs that are offered. Some boards offer more than 1000 programs, so it is a good idea to save the list rather than read through it online.

Some sysops request a small fee before allowing callers full access to the downloading section of their boards. Others require that a disk of programs be mailed to them first. Most operators simply ask that you send (upload) a program in exchange for downloading several of the board's. Even if there are no restrictions, remember that telecommunicating is a two-way street. Information needs to flow both ways. If you have written a program, or if you have a noncopyrighted game or utility, most BBS's will welcome you if you are willing to upload a copy.

Calling All Brands

A bulletin board does not have to be running on a Commodore for you to call it. Your computer doesn't care which brand of computer answers the phone. You can still read files, leave messages, and add your two cents' worth of comments.

Many boards have sections reserved for specific computers. You may call an Atari board and find special interest groups (SIGS) providing programs and information for IBM, Apple, and other machines. Sysops of these boards often depend on Commodore callers and assistant sysops to provide the programs for downloading to other Commodore users.

Messages

Another popular feature on boards is the message center. If you have a question about a certain piece of hardware or software, if you want to discuss politics, or if you want to sell your old plain-vanilla modem and buy a super-deluxe model, you can leave a message on most boards and expect to find replies in a day or two. Most boards have message bases for items of general interest, computer interest, and areas of special interest. If you have an interest in amateur radio, science fiction, or some other hobby, look for your SIG on a board's menu.

You can find messages pertaining to items for sale, humor, philosophy, teenage topics, adult-only topics, or any other area of interest to its users. If enough callers express an interest in a certain field, the sysop will probably allot space for it. Many BBS's have several disk drives, including hard drives that can hold millions of bytes of information; on such boards there's room for plenty of interests.

Number, Please

Check with local user groups for BBS's in your area. Often clubs operate their own boards. Other users are a good source for telephone numbers of interesting boards, and BBS's often have listings of other boards. You should be aware that BBS's tend to start up and disappear with little or no notice. Don't be too surprised if your favorite board is suddenly gone one day.

Sofstar Services

One prime source of BBS telephone numbers is Sofstar Services Bulletin Board System, operated by Robert Manis in Hilton Head, South Carolina. Sofstar, which runs on an IBM PC with a 30-megabyte hard drive, can be reached 24 hours a day at (803) 686-5978, and supports modems operating at 300, 1200, or 2400 bps.

When you call Manis's BBS, a message informs you that Sofstar supports IBM's and IBM-compatible computers only. There are no programs available for downloading to other computers, but you still can access the message system and the text files.

Manis edits a newsletter for sysops and tries to keep track of which boards are up and which have ceased operation. His board has a listing of hundreds of BBS's. You can search for them by requesting the state or area code. This is the time to make certain your terminal program will capture the incoming text, because you'll want to save all the numbers Sofstar can provide.

The Embassy Online

If you're looking for interesting BBS's in the New York City area, you'll probably come across several telephone numbers for a BBS called The Embassy Online. Even if you're not in New York, this board is still worth a call.

Most bulletin boards are operated by individuals on their personal computers at home. This board is running on a Hewlett Packard 3000 Series III, which has 2 megabytes of core memory and another 256 megabytes of online storage. The Big Apple Users Group, the Columbia University Macintosh Users, and other volunteers formed a nonprofit group called the Dorsai Embassy to run the system.

Jack Brooks oversees operations, but he has help from volunteers who manage the Commodore, IBM, Apple, and CP/M sections. Alex Rodriguez is the Commodore section manager. Embassy has six telephone lines for computers, plus a voice line, and supports forums, electronic mail, conferencing, online games, plus uploading and down-

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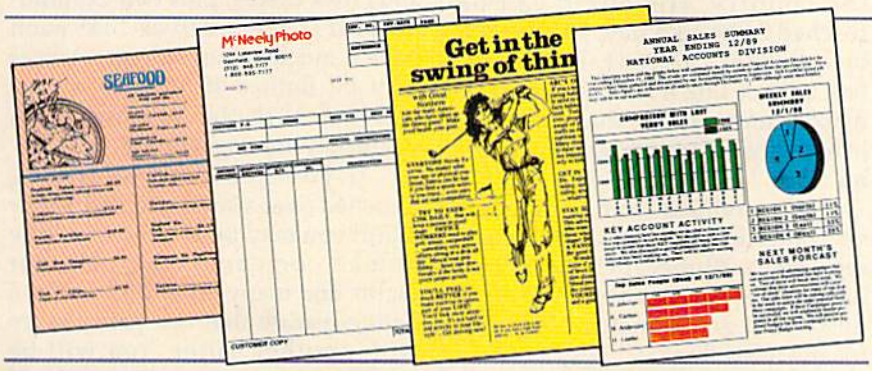

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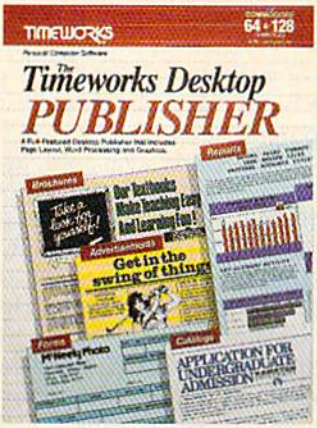

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loading of public domain software.

Bulletin boards usually impose time restrictions on callers, and may limit the number of downloads. Brooks says that Embassy Online is different. "I want to stress that we have no upload/download ratio. Callers are free to download all they want, and we place no time restrictions on anyone."

If you call Embassy Online, be prepared to stay a while. Its main menu begins with only seven choices, but soon branches into hundreds of interesting areas.

Callers may read or leave messages in any of these areas, ranging from the General Message Base to the Space Frontier Society. If you would like to try your hand at team poetry writing, drop a message off on the Kultcha board, (where culture is spelled with a New York accent). One person starts a sonnet and then turns it over to the others to finish. The results may not challenge Shakespeare, but they can be amusing, Brooks said.

Downloads can be found under the following categories: utilities, games, communications, music, disk utilities, science, and recent uploads. When you decide on a type of program, you will be presented with several screens listing the program's name, its size, the date it was made available, and a brief description.

If you are not satisfied with your current terminal program, access the communications downloads. There you will find a choice of at least eight terminal programs you may want to try, including a couple designed specifically for the 128. One program called THIRD .PRG is billed as the best public domain terminal program for the 64.

If you think you can outwit the computer or other callers, try the Online Games section. You should find at least ten games running on the HP mainframe that will give you a run for your money—or your life.

If your modem is running at 300 bps, Embassy Online can be reached by calling area code 212 and any of these numbers: 431-1944, 431-1948, or 966-6406. Modems operating at 2400 bps should call the same area code and either 925-8231 or 966-4653. If you are using 1200 bps, you may call any of the numbers listed.

ARB BBS

Arthur Brock, who lives in Langhorne, Pennsylvania, has written his own Commodore BBS program that he calls "ARB." The program has found favor with other sysops, and now there are a number of ARB boards that form a network across the country. His board can be reached 24 hours a day, 300 or 1200 bps, at (215) 752-7841. He also offers a voice line if you need special help or information. That number is listed on your screen when you call his BBS.

His modified Commodore has several disk drives attached, including Xetec's 20-megabyte Lt. Kernal hard drive. Brock said that space is filled with an estimated 1500 files for downloading.

The board offers many of the same features found on other systems: messages, downloads, games, and at least a dozen different subboards listing the numbers of other BBS's. Brock also has a section that puts the Commodore's color and graphics capabilities to fine use. Make sure your terminal program is capable of displaying color graphics or all you will see is a screenful of strange characters.

A file called the Drawing Board challenges callers to design their own graphics and add them to the board. Other files in this section depict U.S. and Soviet arm wrestlers in competition, a superhero rescuing a kidnapped woman, and other constantly changing color files. Brock's board provides detailed instructions for terminal programs using Commodore transfer protocols. Once again, be prepared to save the directories of games, utilities, and documents. They fill at least 11 disks on the menu.

Harbor Lights

When you dial (207) 967-3719 with your 300- or 1200-baud modem (baud is equivalent to bps), a message informs you that "You are sailing toward the Southern Cross . . ." and have arrived at Harbor Lights, Rick Lembree's BBS in Kennebunkport, Maine.

If the main menu seems familiar, it is because Lembree's board is running an ARB system from Arthur Brock. Harbor Lights also supports a color graphics section that allows Commodore users to put their artistic talents on disk for others to admire, alter, or obliterate. You may also add your comments to a user-supplied bulletin board listing, story board, opinion poll, trivia quiz, war room, or ramblings by users called Dumb Liners.

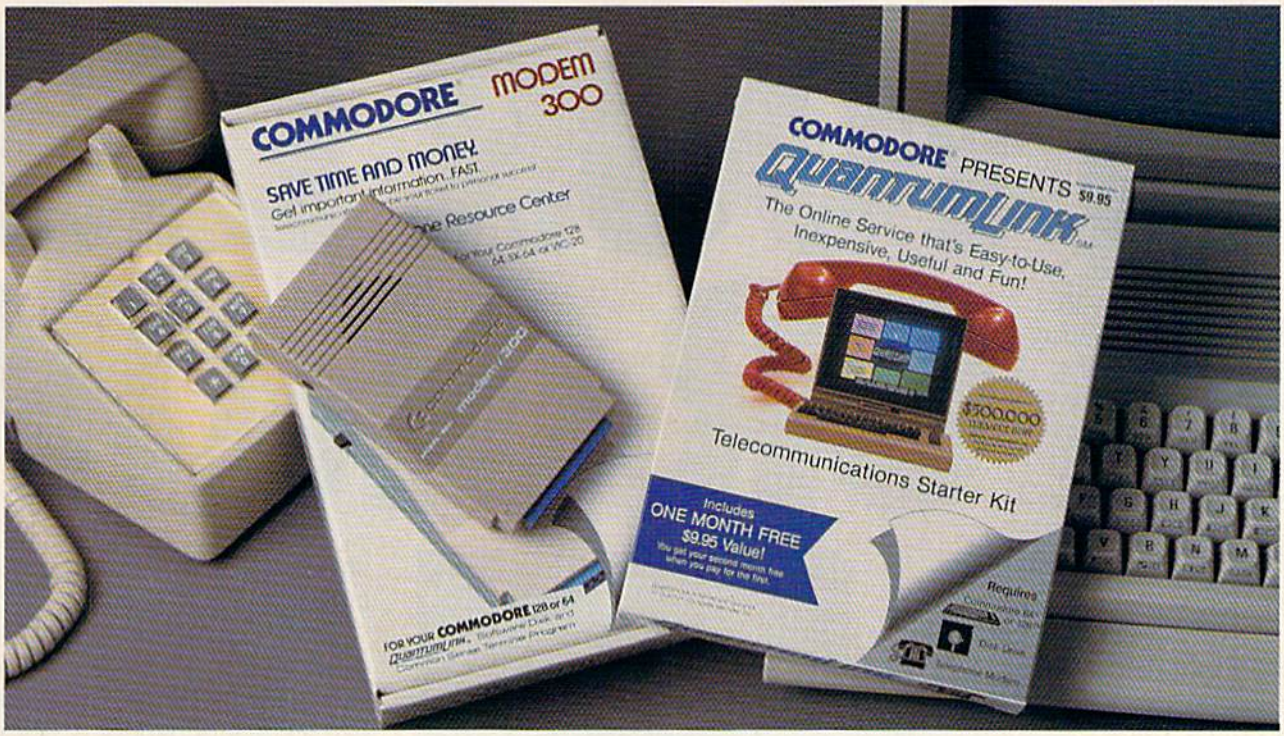
Lembree's 64 has a couple of 1541 disk drives, plus two Commodore SFD-1001 drives that each have a megabyte of storage. Access may be limited if you are a new user, so check the bulletins when you apply for registration.

If you get tired of sitting hunched over a keyboard night after night, you may be in need of a little human companionship. Harbor Lights and many other BBS's offer a dating feature that can pair you up with another caller. You will be asked questions about your personal likes and dislikes, and your answers will be compared with those of other callers. The results will reveal the percentage of questions you and others answered similarly. If you find someone who seems compatible, you can leave that person a private message. From that point you're on your own.

Phone Bills

If you find you're doing a lot of long-distance telecomputing, you may want to investigate a couple of services designed to help your pocketbook. PC Pursuit is a service run through Telenet that is owned by U.S. Sprint. This service allows you to make an unlimited number of calls between the hours of 6 p.m. and 7 a.m. weeknights, and 24 hours a day on the weekends for a flat rate of $25 per month. A one-time $25 registration fee is required, and you must sign up with a credit card. You can subscribe by calling their 24-hour BBS at 1-800-835-3001, or you can contact a representative at 1-800-835-3638.

AT&T offers a plan called Reach Out America that charges $9.10 for an hour's worth of out-of-state telephone calls, and $7.55 for each additional hour. The special rates are in effect from 10 p.m. to 8 a.m., Sunday through Friday, all day Saturday, and until 5 p.m. on Sunday. You also will receive a 15-percent discount on all calls made between 5 p.m. and 10 p.m. The plan has a $10 registration fee.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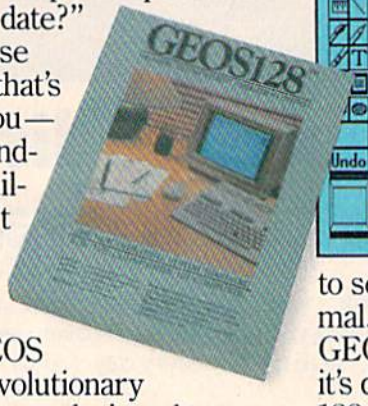

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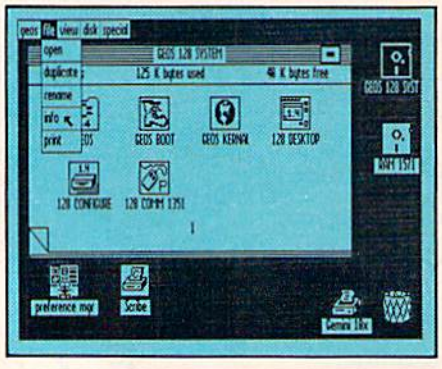

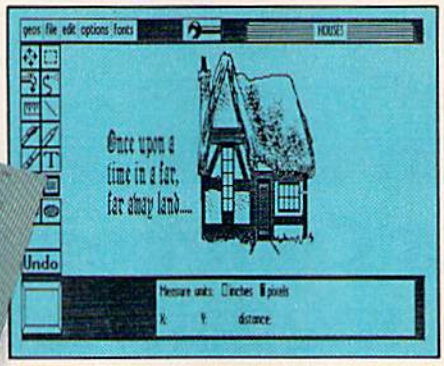

to seven times faster than normal. Part of that's due to the GEOS disk Turbo, but most of it's due to the fact that GEOS 128 doesn't treat your 128 like a C64.

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Fast and slick with mouse or stick.

Using GEOS is ridiculously simple. All you need is a mouse or joystick, and a keen ability to point and click. Everything else is pretty much a matter of reading *menus* (a technical term for "little lists of things"), or selecting *icons* (a technical term for "little pictures of things"). It's sort of like talking in sign language.

For example, if you want a document for word-processing, you point to the icon that looks like a stack of papers. Click your mouse and bingo—you're in the file. If you want to erase the file, you drag the stack of papers over to the little waste basket and click your mouse.

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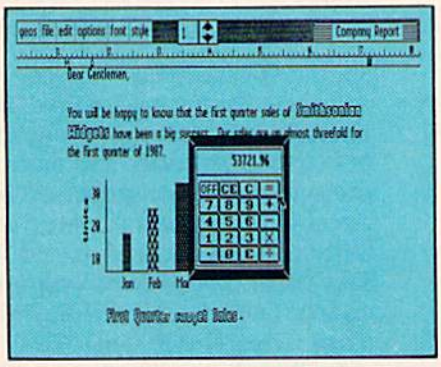

GEOS 128.

You keep your documents and graphics in files; everything else stays right on the desktop: the notepad, the calculator— there's even an alarm clock. In fact, the only thing our desktop

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Now, we realize that's a lot to pack into one GEOS package. But as long as we're packing it in, we might as well let you know something else: There's more.

doesn't have is a place to put your feet when the boss isn't around.

But not only does GEOS give you a place to write and draw, it actually helps you write and draw better. Because unlike your basic office model, our desktop comes with geoWrite and geoPaint built right in.

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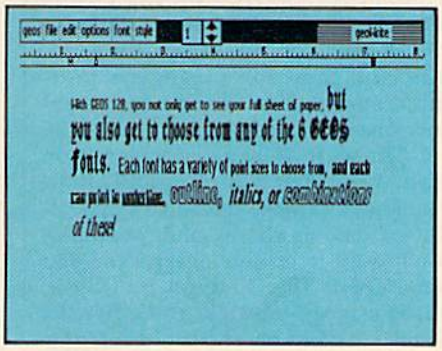
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but you also get to choose from any of the 6 GEOS fonts. Each font has a variety of point sizes to choose from, and each can print in underline, outline, italics, or combinations of these!

Then place them wherever you want: either in your geoWrite document, or in your GEOS Photo Album for later use.

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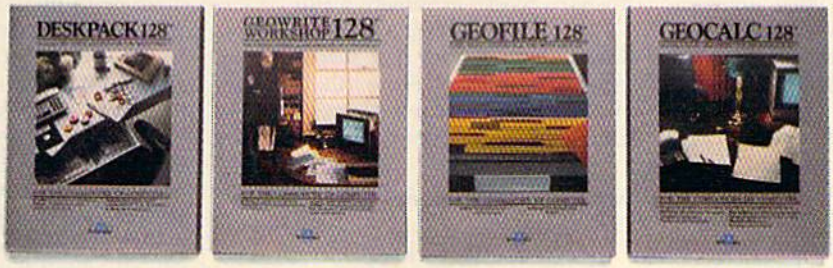

The more you put into your system, the more you get out of it.

Of course, when we say that GEOS 128 has far-reaching implications, we're not kidding around. Every GEOS 128 package includes free QuantumLink software, which hooks you (via modem) into a nationwide network of Commodore people just like you. There's even a service that will Laserprint your documents for you.

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Alternate Reality—The Dungeon

When the Commodore 64 first began to show its potential, practically all game buyers hoped that Sir-Tech Software would port its extremely popular game *Wizardry* to the new machine. For some reason, it never happened, and software companies since have been trying to fill the void. Dungeons & Dragons–style games have proliferated for all personal computers since that time, but none has really taken *Wizardry*'s place.

Like most such games, *Wizardry* set you inside a dungeon filled with unspeakable horrors and magnificent wealth; what made it different from the others was its sense of visual perspective.

The dungeon revealed itself only as you moved through it, and you could see only a short distance ahead of you. If you didn't have light, you couldn't see at all. The game contained many other fine features, but this personal perspective was its true genius.

It was the closest thing yet to the role-playing experience.

Datasoft's *Alternate Reality* series tries very hard to bring that experience to the Commodore 64. *The Dungeon* is the second release (*The City* was the first) in the series and, according to the manual, *The Arena, The Palace, The Wilderness, Revelation, and Destiny* are in various stages of preparation. Like *Wizardry*, Electronic Arts' *Bard's Tale*, and SSI's *Phantasie* (to name just three), the *Alternate Reality* series allows you to transfer your characters from one installment to the next, thereby stressing the idea of the continuing adventure. In fact, *The Dungeon*'s manual talks about *The City* repeatedly, as the designers clearly expect owners of *The City* to continue their interest with *The Dungeon*.

When the game begins, you create a character. The method is a refreshing one. Your six Statistics (Stamina, Charm, Strength, Intelligence, Skill, and Wisdom) are displayed on what looks like a Vegas slot machine. Under each Stat is a little box with constantly changing numbers, rolling from top to bottom at varying speeds and in random order. To create your character, you simply name it and decide on its gender. Then you press the space bar at any time you choose, and all the numbers stop. These are your character's values. Obviously, luck plays an important role here, but the process is such a good one (and the numbers seem to balance out), that the luck is entirely palatable.

One of the chief differences between Alternate Reality and most other role-playing dungeon games is that you control only one character. In most games, a party of adventurers, consisting of a variety of types (a Sorcerer, a Fighter, a Thief, and so on), tackles the dungeon in a sort of unionized cooperative, but here you're on your own. Because of the strict player perspective, this idea works extremely well.

Once in the dungeon itself, things flow smoothly. Your first stop is at the inevitable General Store (the Damon and Pythias Shoppe). Here you buy food and water (your character gets hungry and dies if you don't), torches, a compass and a timepiece (both essential but always out of stock), and clothing and weapons. Actually, the choices at first are easy, since you barely have enough money to buy even a dagger. You'll learn quickly, though, that the proprietor doesn't really mean what those nasty price tags say. With any luck at all, you'll come out with a cheap weapon and maybe even the beginnings of armor.

> Alternate Reality *is not just another adventure clone. It has a flavor and perspective all its own.*

Adventuring itself is fairly standard. As you stroll the various corridors and levels of the Dungeon, you will encounter things. Some of these things are nice, while others try to kill you. You enter rooms, some of which require magic to open, you give money to paupers, and you kill an almost unending series of giant rats, molds, and slimes. Some creatures yield money, items, or weapons, and you can choose whether or not to take these along.

Many creatures, though, disease you, and killing people often results in a curse. Both the diseases and the curses affect you when you least expect it.

As you get further into the Dungeon, you encounter more interesting life forms: Guards, Gladiators, Knights, Noblemen, Brigands, Assassins, Wizards, Valkyries, Serpentmen, Ice Demons, a Phoenix, Dragons, a Night Stalker, and (it is rumored) a Devourer. Not all of them seek to destroy you, and you shouldn't fight all of them, either. Perhaps the strongest feature of *Alternate Reality*, in fact, is its notion of Moral Alignment. You enter the dungeon as a Neutral, but your actions dictate whether you become Good or Evil. Killing a pauper is an obvious evil, but some acts are more subtle. You may, of course, choose to become evil. Whatever you do, the program keeps track, and your alignment goes with you as you explore. Its effect is very strong.

At some point, you will want to join a Guild. Four guilds are evil; four are good. Guilds offer several things, but the most important is a ring that allows you to learn and to cast spells. Until you join a guild, you have no magic whatsoever, so finding the guilds should be high on your list of things to do. They're not, however, easy to locate, and they don't want inexperienced adventurers. Nor do they want poor ones.

There are all kinds of things to do down here. You'll be offered Quests, you'll have to make extensive maps (always a tedious chore), and, of course, you'll want to explore every room you come upon. The Dungeon isn't huge, but it's large enough and difficult enough to consume enormous amounts of time. By the time you've finished it

More Bang For The Pound.

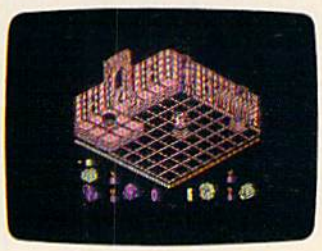
It's an invasion of British action hits at prices packed with value. For a few pence more than eleven quid, or about $19.95 in the States, you can experience the unique look, feel, and play of a leading import.

Wizball™ has been bouncing atop the British best-seller charts for months. No wonder. Fun, danger, logic, and action all come together in this colorful confrontation between Wiz, his feline friend Cat, and the Evil Zark.

Returning the color to Wizworld is the challenge. Expect to be dazzled by graphics as you discover the secret powers and controls of the wondrous Wizball.

Anyone looking for incredible graphics will do back flips when they see *Head Over Heels*.™ Upon landing, they will probably double over with laughter.

Fun is what this game of cunning puzzles and problems is made of. Where else can you explore and liberate five planets with your doughnut gun while running across the likes of the British Royal Family, stuffed bunnies, and the elusive reincarnation fish.



There's treasure to plunder, wealth to pursue, and oriental pleasures to partake in *Tai-Pan*.™ Based on the James Clavell classic, this adventure combines trading skills, strategy, and combat as you seek your fortune.

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You'll just have to jump into your small scout ship, use four types of weapons to zap fifteen different opponents, and thereby insure the survival of humanity.

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all, the next *Alternate Reality* module should be available, and you can start over again.

There are two major problems. First and most important, disk access is excessive and extremely annoying. Every time you encounter something, the disk drive goes a-whirring and the screen starts flashing. Several seconds later, the creature appears and, after you deal with it, the whirring and flashing begin all over again. Just as frustrating is the means of saving a game in progress. Like many recent games, *Alternate Reality* doesn't allow you to save and keep playing. Instead, the game reboots, and if you want to continue from where you stopped, you have to load the character back into memory. I don't know why designers have taken to this tortuous method. In games where death comes easily, efficient and painless saves are absolutely mandatory. This game is time-consuming enough; unnecessary time consumption quickly becomes a source of resentment.

Is it worth the time? If you like this kind of game, yes. Fans of *The Bard's Tale* series, especially, should find it fascinating, because even though it lacks some of *Bard's Tale*'s programming sophistication, it seems as strong or stronger in its variety of activities and goals. *Wizardry* fans, too, should enjoy this series because it clearly stems from the *Wizardry* tradition and, in some ways, may even be better. Even so, *Alternate Reality* is not just another clone. It has a flavor and perspective all its own, and it is enjoyable despite some disk-management flaws. If Datasoft corrects these, the series could become a role-playing classic.

—Neil Randall

Datasoft
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Rainy Day Games

It's raining. Or it's snowing. At any rate, it's too gloomy and cold for the kids to go out. And they are driving you nuts.

You know the kind of day.

"Mom! Katie won't leave me alone! She's getting into my crayons. Mom!"

"Am not!"

"Are too!"

"Mom, make those two stop, pleeease!"

"But, Mom, there's nothing to do!"

"Yeah, I'm bored!"

"Bored!"

They've read all their books. Coloring is boring. TV is boring. Board games are really boring.

The suggestion of a card game sparks some interest—but the kids can only find 49 cards.

If you have *Rainy Day Games* by Baudville, you just may find your problem solved. For one thing, there are few children in computer homes that will call the computer or its myriad software boring. And *Rainy Day Games* is based on three traditional favorite card games: Old Maid, Go Fish, and Concentration. All three games are included in the program. Surprisingly, they have made a very pure transition onto computer. Card games often lose something when translated into software, but these three have not.

Card games often lose something when translated into software, but these have not. And Rainy Day Games *is easy to use—any child who can operate the computer can handle these games.*

Rainy Day Games is easy to use—any child who can operate the computer can handle these games. No reading skills are required. Four options appear on the main menu: the three games—Concentration, Go Fish, Old Maid—and the Options menu. The Options menu lets you choose between keyboard and joystick, and Sound on or off. You can also set the level of play (Beginner, Smart, or Genius) and, for Concentration, the number of players and the number of pairs to be matched. These changes may be saved to disk if you prefer.

Your opponent in these games is one Ted Bear, a cute little fellow who

hops from card to card in Concentration, scans his hand of cards in Old Maid and Go Fish, and both wins and loses with cheer and good grace. Your name or Ted Bear's name is highlighted to denote whose turn it is. The score is kept beside the names.

Baudville has done an excellent job on the graphics in *Rainy Day Games*. In Go Fish and Old Maid, another animated creation, this one named Mr. Monkey, turns the cards for you and Ted Bear. The cards actually appear to be bending as he turns them. In Go Fish, the deck grows smaller as cards are drawn off. And when a match is made in any of the games, the graphics on the matching cards move and make sounds. Even small children enjoy this part of the game. Our daughter Katie giggled with delight every time she saw an egg crack open, or a dog pant and wag his tail.

Contained in the manual is a note to parents: "Card games are an excellent way to help children grow intellectually and emotionally. They entertain and at the same time help young children develop their ability to concentrate and use strategy. The *Rainy Day Games* package is designed to take advantage of these traditional aspects of card games while adding new dimensions through the use of the computer."

Rainy Day Games follows through on its design. It is a well-executed, entertaining package. The animated graphics are superb, giving youngsters and even adults a lively, fun-filled way to remove the rainy day blues.

—David and Robin Minnick

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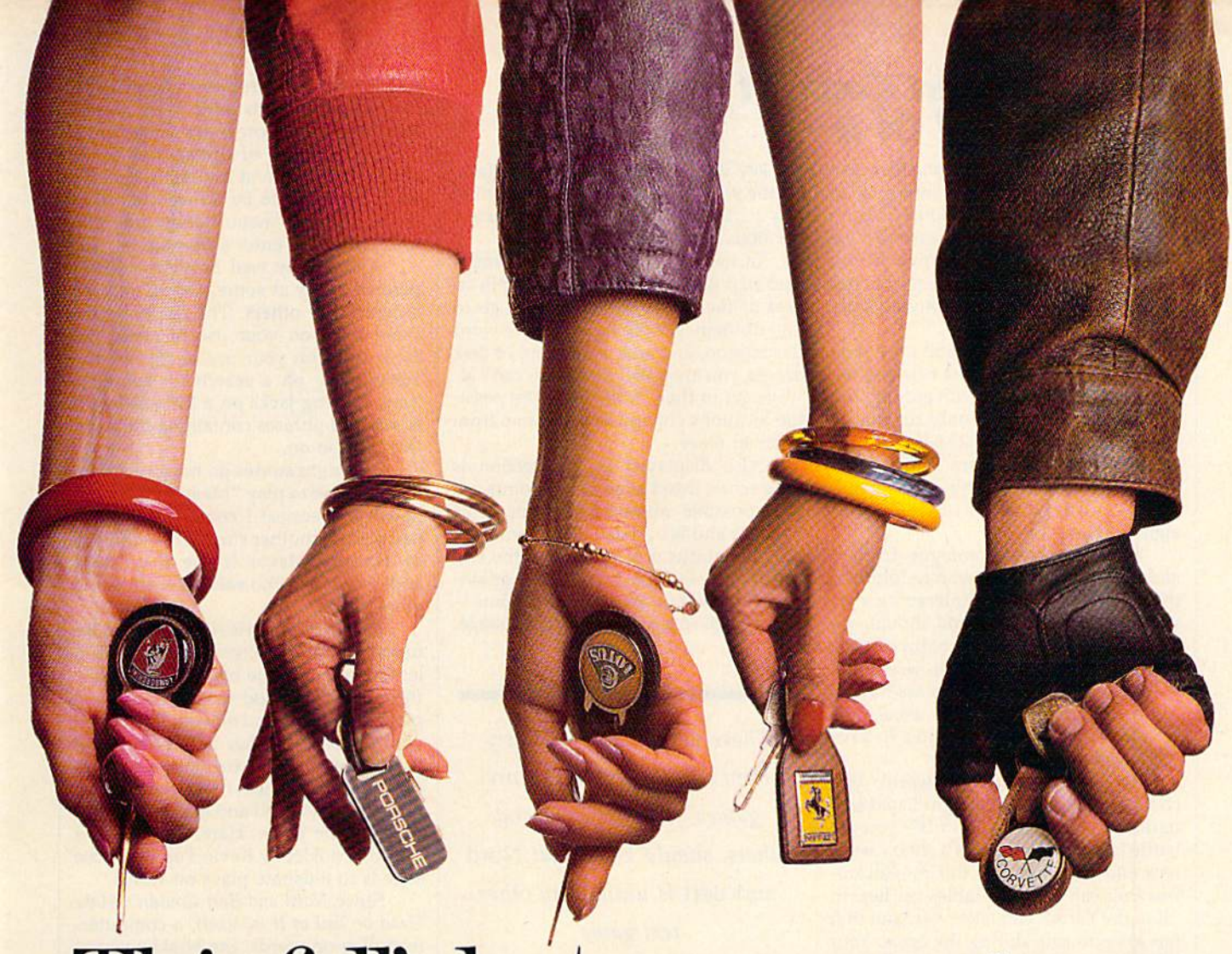

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Nord And Bert Couldn't Make Head Or Tail Of It

Since my first look at *Nord and Bert*, I've been chafing at the bit, wanting to let the cat out of the bag. Obviously, I can't tell you everything I've learned—we don't do that with interactive fiction puzzles—but I may be able to tell you enough that you won't be buying a pig in a poke. (Clichés.)

Nord and Bert is unique in several aspects, the first and most obvious being that it is not one adventure, but eight. In fact, since the only conclusive ending to any of these stories is the attainment of a maximum score rather than a triumphant climax, one might even say that these are "pieces of eight." (Pun.)

In an onscreen prologue to *Bord and Nert* (spoonerism), you're told that the town of Punster is undergoing a severe syntactical crisis. And though we don't wish to make a mountain out of a molehill, this strange crisis is enough that the citizens of the town are having trouble communicating. As usual, it is up to you and your computer to save the world.

To begin saving the world, you choose from one of the eight listed scenarios. In "Eat Your Words" you do battle in a restaurant with a sleazy waitress and will probably not prevail unless you can turn the tables on her. In "Buy the Farm" you take over land that has gone to ruin during the crisis. Your job is to try to make a silk purse out of a sow's ear. In "Visit the Supermarket" you cruise your cart through the British aisles and may even be forced to engage in gorilla warfare. "Playing Jacks" puts you in charge of a wonderous device called a *Jack-of-all-traits*, but it's up to you to figure out which of its traits will be helpful to you. And "Shake a Tower" deposits you in the magical section of Punster, where a pan of keys or a rare hazing experience must be carefully examined for evidence of spoonerisms.

Those who have previously been daunted by adventure games, from Infocom and others, should know that *Nord and Bert* is unlike any other text game. There are no magic spells (although uttering a cliché or spoonerism at the right time might drastically change the scenario, as well as win you some points); the only mazes are those created by the convolutions of language; the one character trait needed is a wagging tongue; and the necessary wisdom can be confined to what we might call—lumping everything together—a knowledge of folk language.

Nor is it necessary, in using the vernacular, to worry about the proper syntax. The parser accepts a truncated version as well as a long one, provided the key words are there. The interface, by the way, is as good as or better than any parser I've seen from this parsermonious company.

In moving about the game, you'll find all possible destinations listed in an area at the top of the screen. To go to any of them, simply type the one word description, and after a moment of disk access, you are there. Since you can't always get to there from here, the possible locations change as you move from place to place.

Also displayed in this section is your score, listed as so many points out of a possible number of points. This changes and is updated as you triumph over the quirks of language. At the end of a game—which can be the attainment of all but one or two points—you'll be given a congratulatory message.

Those who have previously been daunted by adventure games, from Infocom and others, should know that Nord and Bert *is unlike any other text game.*

For some time now, those of us who became hopelessly lost in *Zork* or *Planetfall* have relied on Infocom's "Invisiclues" booklets, available separately, to carry us through situations that would otherwise remain hopeless. In *Nord and Bert*, the Invisiclues book is on the two-sided disk and may be accessed at any time by typing the word "hint." As with the real book, which reveals clues only as needed by the device of painting over them with a marker, Invisiclues on disk reveals only as much as you wish to know at the time.

The first screen presents a list of artifacts and happenings that may have you stuck in one spot. Choose the one you wish and the next screen will give you a very broad hint. If that isn't enough, press RETURN and you'll read something more specific. Though the number of steps varies, you can eventually reach a point where you are given the complete answer. Return to the story at the point you left off, type it in, and away you go.

Be aware that there are some wild goose chases here. As is Infocom's way, and in keeping with their corporate humor, a real goose is used. Well, almost real. You know how these things go.

Should any of the stories seem hopeless, you can at any time type the word *beginning* to be transported back to the opening menu, where you can then choose to enter a new story.

And it may well be that you will succeed easily at some stories, and fail miserably at others. The Supermarket story relies on your use of puns, the Farm story on your use of clichés, the Tower story on a search for spoonerisms, Playing Jacks on a knowledge of words and phrases containing the word *jack*, and so on.

The eight stories do hang together. I was unable to play "Meet the Mayor," however, because I could not prove I had solved another story. This seems to be because Mayor is the final story and—to those who solve it—offers the grand climax.

Documentation is slight, as in all Infocom games: Infocom doesn't want to let the cat out of the bag. And, as usual, there is a very good section on how to play such games and on your interaction with the parser. It has become my custom to immediately rip open any Infocom game and see what crazy items have been included and how they might relate to the game. Here, the item is a cartoon booklet by Kevin Pope—whose style is to illustrate plays on words.

Since *Nord and Bert Couldn't Make Head or Tail of It* is, itself, a computerized play on words, the booklet serves as a perfect introduction. The game title, in fact, is from an original cartoon by Pope, and it sets the tone for all that follows. This one should appeal to most everyone; I especially recommend it to those who have previously bypassed text games. *Nord and Bert* is truly different, and that's as sure as little green apples.

—Ervin Bobo

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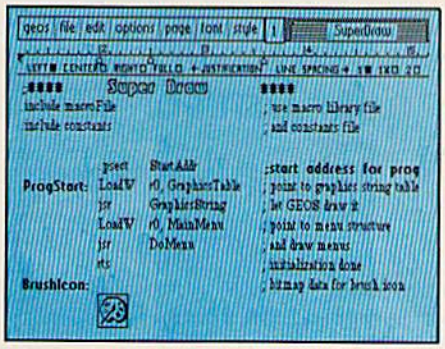
geoAssembler not only reads directly from geoWrite files, but contains enough Pseudo Ops to allow all kinds of conditional assemblies. It has all the state-of-the-art features you'd expect, including some you probably never thought possible. For example, integrating graphics is as simple as cutting and pasting the image from geoPaint directly into your program.



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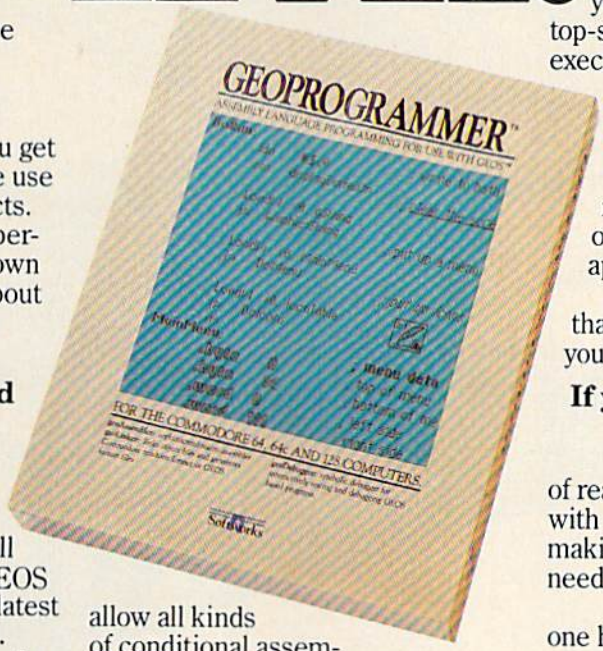

geoLinker ties your program modules together, supporting GEOS SEQ and VLIR applications and desk accessories. You can even use geoAssembler and geoLinker to create non-GEOS applications.

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Pro enough for you yet? Well, that's only a *partial* list of what you're in for.

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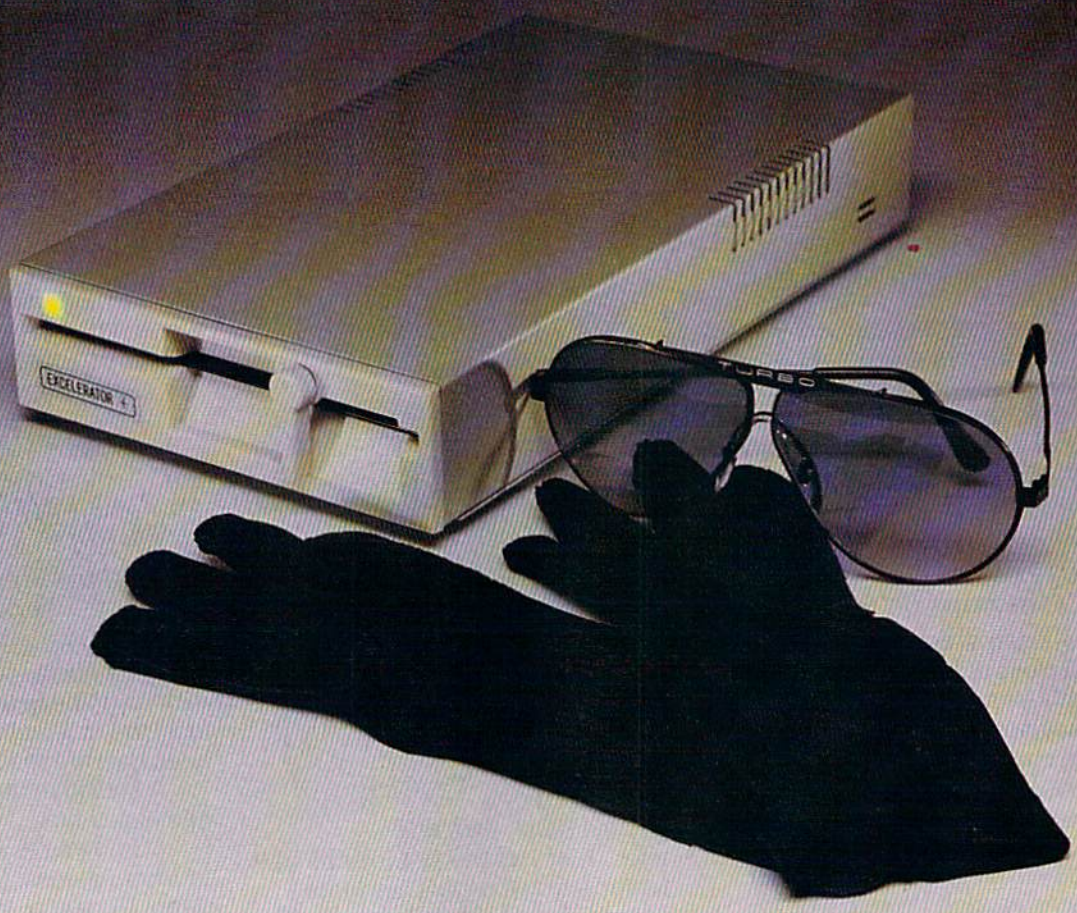

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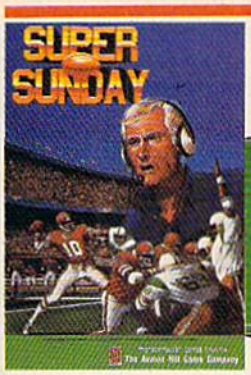

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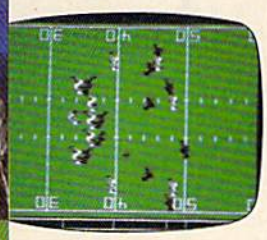

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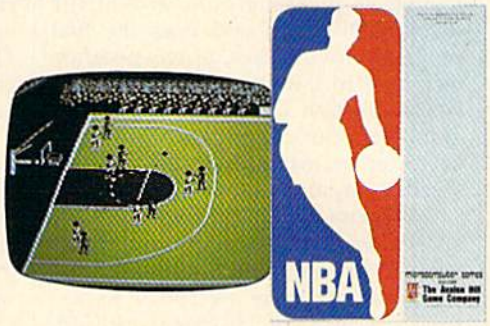

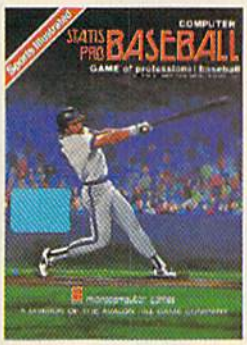

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Dolphin DOS

Dolphin DOS, from South Australia's Micro Accessories, is a hardware modification to both the 64 and the 1541 disk drive (all software is in ROM). Though Dolphin DOS promised disk access up to 25 times faster than normal, I was leery of fiddling around with the insides of my machines: I'd heard such promises before. My hesitation grew when I read in the manual that some installations require desoldering one or more ICs—a task not recommended for the fainthearted (including me).

Late one evening, however, I found myself in an adventurous mood, spurred on by the claim of much faster disk access. Twenty-five times is an order of magnitude greater than any fast-load cartridge I've seen. I decided to investigate whether or not *my* particular 64 and 1541 required any desoldering. When I found out, as is usually the case, that all relevent ICs were *socketed*, and could simply be removed from their sockets, curiosity got the better of me. I made up my mind to go ahead and see just what (and how much time) was involved.

The documentation guided me through the careful coaxing of several chips from their sockets. I replaced them with two small circuit boards, and without drilling holes for the two toggle switches that I could mount later, I was ready to give the circuitry a trial run.

The next stage was hardly encouraging. A standard system check—press f8 to show system status—resulted in a failure several times. I rechecked my work and found that in reseating an IC, I had bent three of its legs out of position. (Those chips have a *lot* of legs, so be careful.) I moved to better lighting and, carefully, with needle-nosed pliars, bent the legs back into position.

> *Before I even* looked *to see how the load was going, the program was ready to run... Dolphin DOS had a convert.*

This time, the status check worked instantly. I next loaded one of my largest files, a 60-block BASIC program. What then happened astounded me. Before I even *looked* to see how the load was going, the program was ready to run. I ran the test again, this time with a stopwatch. My program loaded in less than two seconds. Dolphin DOS had a convert.

This package gives you blinding speed with all disk operations. You can get a complete onscreen directory in one second, and you're provided with fast scratch and validate. I formatted a disk in less than 20 seconds and it took me less than five seconds to save the 60-block file. And *these* savings on program files are reflected in dramatic time reductions for both sequential and relative file access.

I compared the time with several fast-load cartridges: Fastload, Turbo Load and Save, and The Final Cartridge. Each of these loaded my 60-block program in nine seconds; Turbo Load and Final Cartridge saved it in ten. Dolphin DOS—at two seconds for a load and five seconds for a save—is obviously much faster. Dolphin also lists a directory to the screen in about half the time cartridges need, validates (COLLECTs) a disk in 14 seconds, and formats it in 19 seconds. Even Turbo Load and Save takes 27 seconds to do a format. Another Dolphin bonus: The head stop is knocked only once. No more "ratatatat." Another particularly nice thing about Dolphin DOS is its programmed function keys. Actually, there

are 12 programmed keys—each one has another function when pressed in concert with the Commodore logo key. The layout is similar to that of The Final Cartridge: There is a LIST; jump to monitor; RUN; VERIFY; two forms of LOAD; SAVE with automatic (and purportedly bug-free) replace; directory display (memory intact); output list to printer; and scroll backward and forward monitor disassemblies.

Additionally, the default drive number is programmable, and SHIFT RUN/STOP loads and runs the first program on your disk, or *any* program displayed in the onscreen directory. A single function key also loads a program from the directory. The function keys can be instantly enabled or disabled at any time.

Dolphin also gives you numerous screen editor functions, accessed through special control-key combinations. Among those are cursor to bottom of screen, or 20 spaces forward; delete to the right or left of the cursor; print screen; and display directory or drive status.

A disk wedge is also included, along with several enhancements. Files can be locked and unlocked. The default device number can be changed. The number of tracks accessible on a disk can be set either to the standard 35, or to 40, essentially giving you another 749 blocks. Of course, programs saved on these outer tracks can only be accessed by computers with Dolphin DOS installed.

The scrollable monitor is compact and functional; disk commands are accessible from within it; and there is provision for writing ASCII text directly to memory. There are also two enhancements to BASIC: one performs decimal/hex conversion, the other restores a program after NEW (OLD equivalent).

Dolphin DOS is not for everyone. Bear in mind that it requires semipermanent installation, and a specific 1541 and 64 are modified in tandem. In the 64, the Kernal ROM chip is replaced. You should be sure to save your Kernal ROM should you wish to return your computer to its original condition. On the other hand, once the toggle switches are installed, either or both units can be returned to normal operation at any time. If you can manage an electric drill, making the two small holes in the computer's case for toggle switches shouldn't take more than 15 minutes or so.

The manual is excellent with particularly clear diagrams. Instructions are lucid. The only real problem I encountered was a traditional one: The manual's typeface is too small. The only point at which I became confused had to do with the RF shields in both the 1541 and the 64. The shields are required by the FCC (and hence not even mentioned in the Australia-prepared manual), and must be removed in order to get to internal circuitry. The Dolphin board prevents replacing the shields. Your computer will work well without them, just keep your computer equipment a good distance from your television set.

The manual suggests that Dolphin DOS may not cooperate with some commercial software, so there are instructions for seven system alterations that can be tried with difficult software. These alterations progressively disable and slow down Dolphin until it is completely disabled.

I tested Dolphin DOS with 12 commercial software packages, each from a different company, and then tested each with the cartridges mentioned above. The results were impressive: 9 of the 12 loaded easily with Dolphin DOS, with time reductions ranging from 3:1 to 20:1. (With *GEOS*, only seven seconds were trimmed from a 27-second load time.) With one program, load time was reduced from 65 seconds to a mere 3. The programs that would not load required only turning off Dolphin DOS at the 64. After that, I achieved modest load-time savings.

Even more striking were the results achieved when the cartridges were plugged in. (Here's a first: a turbo disk access system that works with other fast loaders.) Turbo Load and Save, and Fastload are completely compatible with Dolphin DOS. Its programmed function keys even remain available. The Final Cartridge requires turning Dolphin DOS off at the 64 while the cartridge's function key commands retain priority over Dolphin DOS. I found that all cartridge functions were accelerated, and most disk chatter was eliminated.

Dolphin DOS is an excellent firmware package for users desiring a semipermanent, super-high-speed disk access system, along with a variety of built-in conveniences. Dolphin DOS and fast-load cartridges operate at different orders of magnitude in regard to disk access, and have different user applications. In a nutshell, Dolphin DOS is an expertly designed product that is in a class by itself.

—*Art Hunkins*

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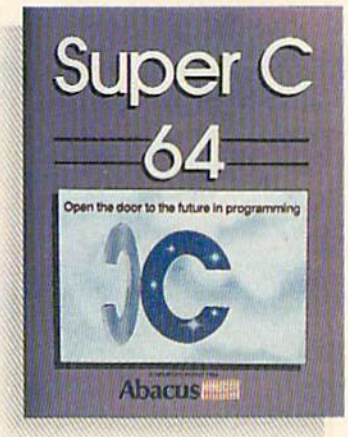

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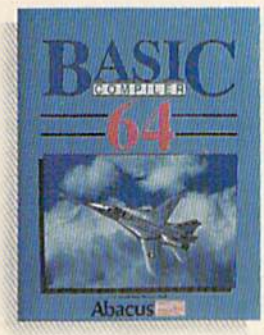

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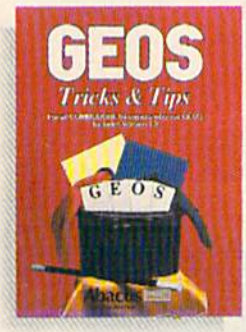

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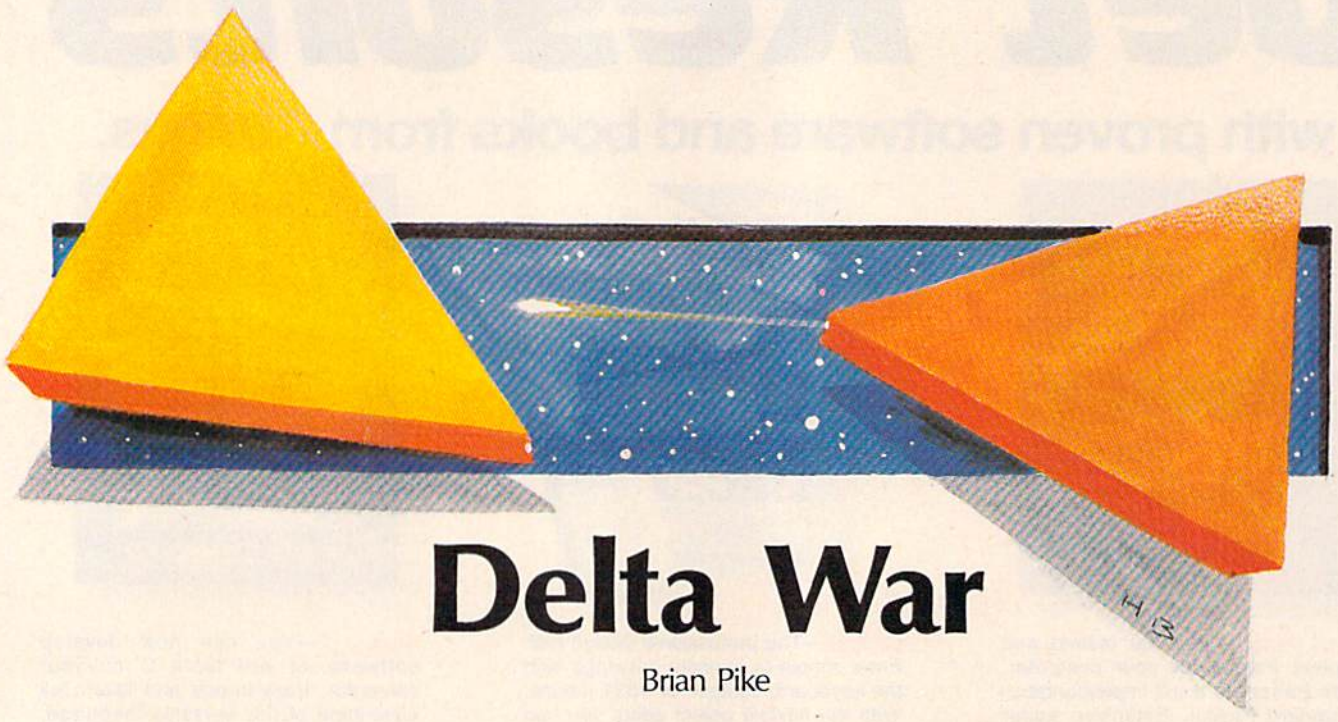

Delta War

Brian Pike

Battle a friend in this fast-paced, two-player arcade-style game for the Commodore 64. There are so many options available that you'll find yourself playing the game over and over again. Two joysticks are required.

You have your opponent in your sights, but you don't shoot. You're just too close to the black hole—any shots fired now would be sucked into oblivion. In desperation you turn 20 degrees to port and apply maximum thrust. Your Deltaship nearly skims the event horizon of the black hole. You slingshot past your opponent, turn around 180 degrees, and launch a volley of shots. Stunned, your opponent dodges your shots, only to fall into the black hole. You've scored a point in "Delta War."

Delta War is a fast two-player arcade game written entirely in machine language. The object of this timed game is to absorb less damage than your opponent. The many options provided make Delta War several games in one. These options include gravitational influences (black holes and stars), varied time limits, and two screen-border options.

Typing It In

Since Delta War is written in machine language, you'll need to type it in with "MLX," the machine language entry program, found elsewhere in this issue. When MLX asks for starting and ending addresses, respond with the following values:

Starting address: 0801
Ending address: 19C0

When you've finished typing in the program, be sure to save a copy to tape or disk.

Two Deltaships face off for a galactic battle.

Delta War loads and runs like a BASIC program. When you're ready to play, plug in two joysticks, load the program, and type RUN. You'll first see the title screen. From this screen you select all the options for the game you are going to play. Move up and down through the options with the cursor-up and cursor-down keys. Change options by pressing cursor right. When you're satisfied with the options, press RETURN to begin the game.

Hundreds Of Games

Delta War is actually 324 different games in one. Let's step through the various options to see just what's possible.

Option 1 allows you to set how the Deltaships and fireballs are affected by the screen boundaries. There are two options from which to choose—Pass Through Boundaries and Bounce Off Boundaries. Pass Through Boundaries lets your ship and fireballs wrap around to the other side when you go off the edge of the screen. Bounce Off Boundaries makes the edges of the screen solid—you and your fireballs bounce off the edges as if they were walls.

Option 2 allows you to determine the setting of the game. With the Star option selected, a bright star shines in the center of the screen. Both the Deltaships and the fireballs are pulled toward the screen's center by the gravity of this star. The Black Hole is similar, but its attraction is much stronger. In No Gravity, there are no celestial objects, just free space in which to battle.

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Option 3 allows you to to determine how far your shots will go. There are three choices: Short Range Fireballs, Medium Range Fireballs, and Long Range Fireballs. Each player can have three fireballs on the screen at once. If you shoot all three in a Long Range Fireball game, it will be a while before you can shoot again.

Option 4 sets the game time. You can select any time from one to nine minutes. An onscreen timer counts down the minutes and seconds until the end of the game.

Option 5 allows you to decide whether or not you will allow a hyperspace move. If hyperspace is allowed, pushing the joystick down will cause you to disappear and then reappear in a random location.

Playing The Game

Choose the options that you wish to play with, and press RETURN. Your Deltaship can be rotated counterclockwise or clockwise by pressing the joystick left or right, respectively. To thrust, press the fire button. Your ship will move in the direction that it is pointing. If there is a star or black hole, you'll be drawn to it.

You score a point each time your opponent dies. This happens whenever one of your shots hits him, or whenever he runs into the star or black hole at the center of the screen. If the two Deltaships collide with each other, no points are awarded.

The scores and the time remaining are constantly displayed at the top of the screen. When time runs out, the player with the greatest number of points is the victor. When this happens, you may choose different options and play again.

Press RESTORE at any time to stop the game. Type RUN to restart.

See program listing on page 101.

User Group Update

Mickey McLean, Editorial Assistant

This list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1987 issues.

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Send typed additions, corrections, and deletions for this list to:

COMPUTE! Publications
P.O. Box 5406
Greensboro, NC 27403
Attn: Commodore User Groups

User Group Notes

The **64/20 Club** of Ventura, CA has changed its name and address to the **Ventura Commodore Club**, 1306 Finch Ave., Ventura, CA 93003.

The **C-128/64 Amateur Computer Club** has changed its address to P.O. Box 1180, Youngstown, OH 44501.

New Listings

ALABAMA

The Lighthouse BBS User Group, Rt. 2 Box 196, Salem, AL 36874

ARKANSAS

Commodore Information Association (CIA), Rt. 1 Box 103 F, Mayflower, AR 72106

CALIFORNIA

Armed Forces Commodore, 4631 Gainard Way, San Diego, CA 92124

ILLINOIS

Survivors of the Sixty-Four Users Group (SOSUG), P.O. Box 6108, Macomb, IL 61455

IOWA

Tricomm Computer Users Group, P.O. Box 4527, Sioux City, IA 51104

MARYLAND

The First Sector Users Group (FSUG), 113 E. Montgomery St., 1st Fl., Baltimore, MD 21230

NEW YORK

The Lost Boys (TLB), 20 Mountain Rise, Fairport, NY 14450

NORTH CAROLINA

Foothills User Group, 1012 Jesse Tr., Mount Airy, NC 27030

OKLAHOMA

Muskogee Commodore Users Group (MCUG), 2429 Georgia, Muskogee, OK 74403

Outside The U.S.

CANADA

L'Association de Micro Informatique de l'Estrie (L'AMIE), P.O. Box 1052, Sherbrooke, Quebec, Canada J1H 5L3

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Club Commodore de Tibas, Marvin Vega, P.O. Box 516, Tibas, San Jose, Costa Rica

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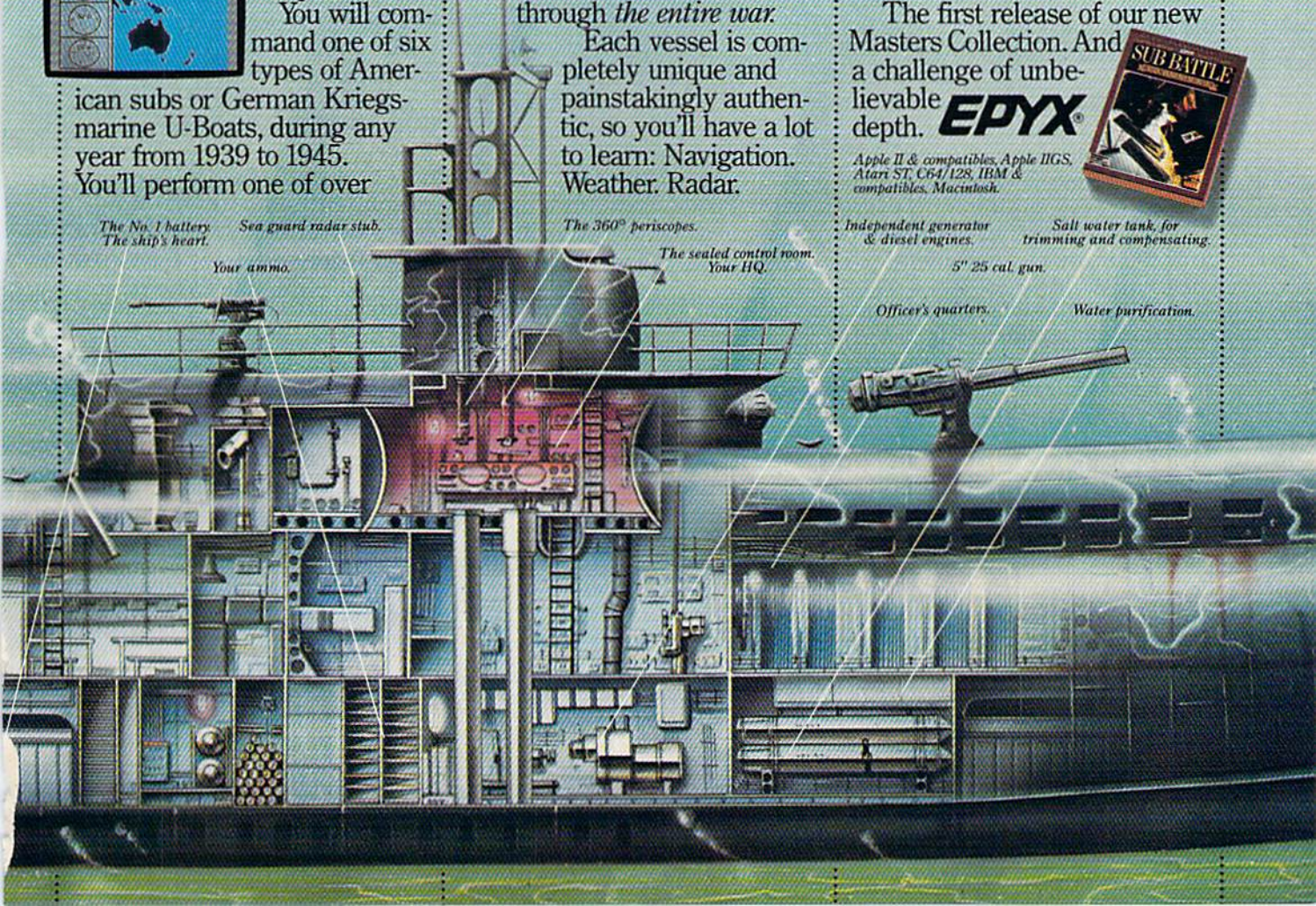
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Cats 'N' Dogs

Fred Karg

It truly rains cats and dogs in this captivating logic game for children. Players take turns dropping animals onto a 7 by 7 grid in an attempt to get four cats or dogs in a row. A pesky dogcatcher keeps things lively. You can play against a friend or the computer. Combining strategy with appealing graphics, "Cats 'n' Dogs" is both challenging and entertaining. A 64 with disk drive and joystick is required.

"Cat 'n' Dogs" is a colorful version of a popular two-player game. Players appear as cats and dogs, competing to get four of their kind in a row. The play field is made up of seven rows of seven dog houses. To place an animal into a dog house, you "drop" your animal down any of the seven rows. The descending cat or dog is placed into the lowest available dog house in that row. Each row is then filled from bottom to top during play. The first player to get four of their animals in a row vertically, horizontally, or diagonally wins.

If you can't find someone else to play against, the computer makes a challenging opponent. And to throw in an element of chance, Cats 'n' Dogs has a dogcatcher option in which an animal regulation officer appears in one of the seven rows, waiting to capture any animal that falls into his clutches, thus foiling the player's move.

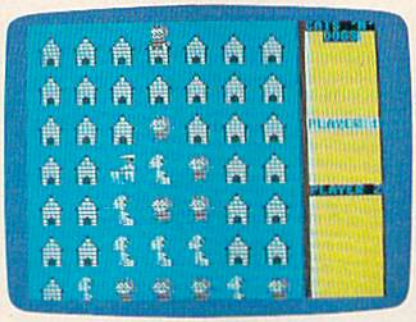
Typing It In

Cats 'n' Dogs is written in BASIC, but it uses a machine language routine to display up to 50 sprites on the screen at the same time. Enter Program 1 using the "Automatic Proofreader," found elsewhere in this issue. Be sure to save a copy to disk after typing it in.

Because Program 2 is written in machine language, you must type it in using "MLX," the machine language entry program also found elsewhere in this issue. When prompted, enter the following information:

Starting address: 3E00
Ending address: 425F

After typing it in, save a copy with the filename CATS 'N' DOGS.ML to the disk containing Program 1. When run, Program 1 expects to find Program 2 with this filename.



Avoid the dog catcher and outwit your opponent in order to win this animated strategy game.

Starting The Game

To play the game, load and run Program 1. After a brief wait, you're asked if you wish to play the computer (press 1) or a friend (press 2).

If you are playing the computer, use a joystick plugged into port 2. If you choose to play a friend, the program asks you how many joysticks you wish to use (one or two). If you select two, player 1 uses the joystick plugged into port 2, and player 2 uses the joystick plugged into port 1. If you have only one joystick, both players must share the joystick plugged into port 2.

Finally, you are asked if you want to use the dogcatcher option. Answer Yes or No. The dogcatcher option adds an element of chance to the game. You never know in which row the dogcatcher may appear. When he does appear, you must be careful not to drop your animal down the row he occupies. If you do, your pet will be captured and brought to the local pound—and you'll lose a turn.

Making A Move

The game is played on a colorful screen filled with dog houses. Player 1 always begins the game. The right section of the screen indicates which player has the current move. Player 1 is represented by cats, while player 2 (the computer in one-player games) uses dogs.

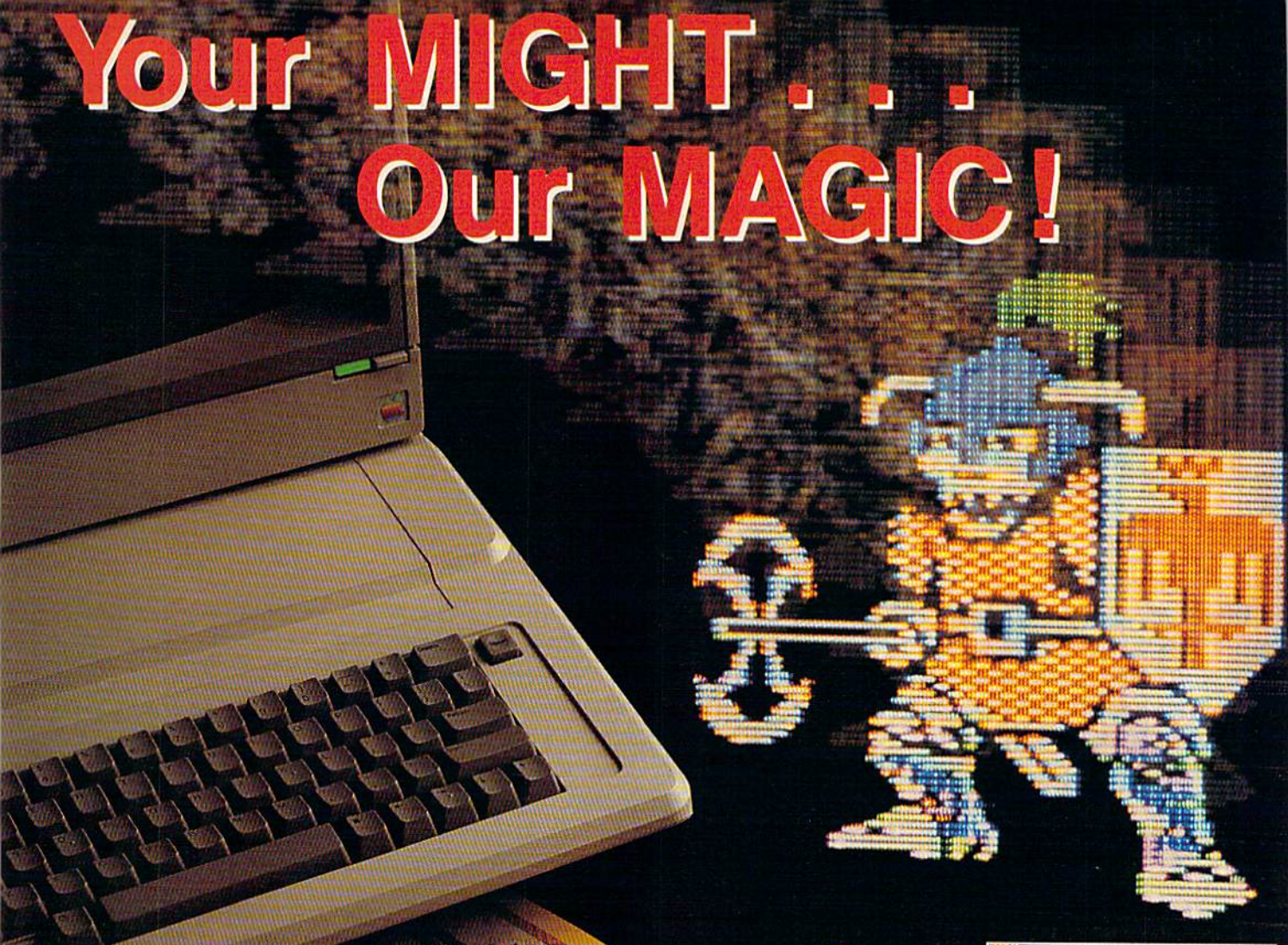
To move, use the joystick; place your animal over the row of your choice. Once you've selected a row, hold down the joystick's fire button until your animal drops. After placing your cat or dog, it's the next player's turn. While the game is played, the dogs and cats that are placed into dog houses move about, providing an entertaining game screen.

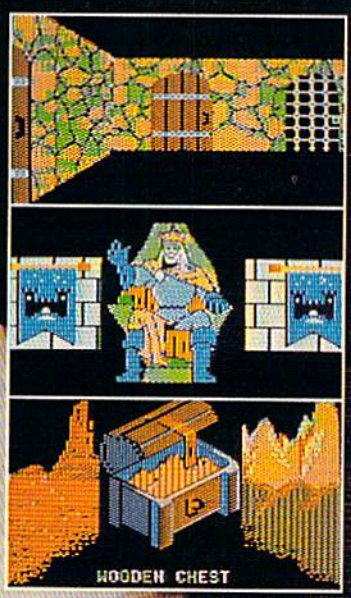
The game ends when one of the players has four of his or her animals in a row vertically, horizontally, or diagonally. Winners are rewarded with a dazzling graphics display starring the victorious animal. If at any time you wish to start the game over, press f1. You are returned to the beginning of the program to select from the game's options.

With the 64 as your opponent, it will first play an average, unspectacular game—not using the best of strategies. If you beat it too often, however, its game improves dramatically.

See program listings on page 104.

Your MIGHT . . . Our MAGIC!





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Needlework Graphics Editor

Barbara H. Schulak

Can your 64 help out with cross-stitching and needlepoint? Yes—in a big way. "Needlework Graphics Editor" allows you to create colorful designs and print them as ready-to-follow needlework patterns. For the 64 with disk drive, color monitor, Commodore 1525/MPS-801/803 printers.

Have you ever tried designing your own needlework patterns? If you have, then you know the process is tedious, time-consuming, and laborious. You must graph the design, point by point, and specify each color by hand. Designing one pattern can be quite a job. With "Needlework Graphics Editor" you'll never have to hand-graph again. This program makes designing and editing needlework patterns simple and fun—and, when you've finished designing, it will print an easy-to-follow pattern with each of the available 16 colors specified by a special symbol.

Because Needlework Graphics Editor is written entirely in machine language, it must be entered using "MLX," the machine language entry program found elsewhere in this issue. Be sure to read the instructions for using MLX before you begin entering data. When you run MLX, you'll be asked for a starting and an ending address for the data you'll be entering. The correct values for Needlework Graphics Editor are as follows:

Starting address: 0801
Ending address: 1618

After you've entered all the data, be sure to save a copy before leaving MLX.

Designing A Pattern

To get started with Needlework Graphics Editor, load it and type RUN. The title screen presents an option to see a list of the commands. Press *y* to see them, *n* to start the program. The cursor is represented by the + character. To move the cursor around the screen, use the up-, down-, right-, and left-cursor keys. To plot a point, press the space bar.

To start out, try a simple design—like a house. As you become more familiar with the editor, you can create more complex designs. If you make a mistake, don't worry, it's easy to erase—simply move the cursor to the point you want to delete and press *e*. Select colors with the f5 or f6 keys. The f5 key cycles the colors upward (white, red, cyan, purple, and so on), and f6 cycles them downward. The current color appears as the border color.

If you decide you'd like to move your pattern to a different place on the screen, Needlework Graphics Editor makes it easy. The f1, f2, f3, and f4 keys shift a pattern down, up, right, and left. There is no wraparound when shifting, so be sure not to scroll your pattern off the screen.

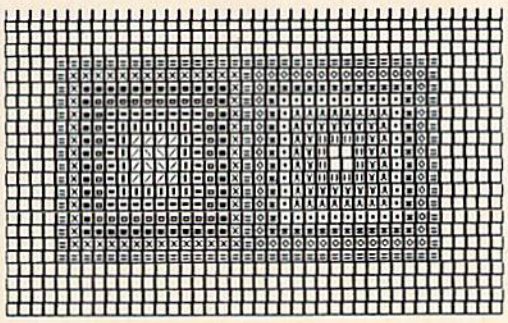
Needlework Graphics Editor also lets you change all the sections of a design that are one color to another color. For example, if you want to change all the green areas in a design to blue, press CONTROL-C. First, you'll be asked to select the color you want to replace by using the f5/f6 keys, as noted above. When you've located the green shade you want to replace, press RETURN. Then select the new color—blue in our example—and press RETURN. Instantly, the colors will be exchanged. You can also use this option to delete a block of color: Enter the color you wish to delete and choose black as the new color.

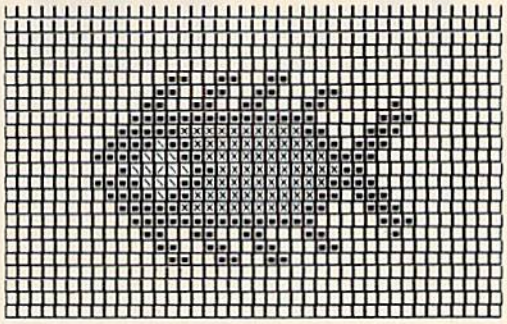
Needlework Graphics Commands

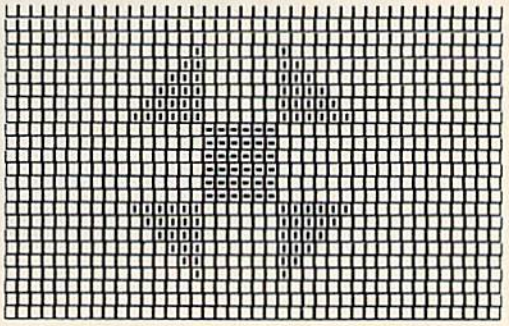
f1	shift pattern down	f2	shift pattern up
f3	shift pattern right	f4	shift pattern left
f5	cycle color up	f6	cycle color down
f7	see commands	f8	exit program

CONTROL-L	load design	CONTROL-P	print design
CONTROL-F	save design	CONTROL-C	change colors

Space bar	plot a point
E	erase a point
@	read disk error channel
HOME	move cursor to top left
CLR	clear screen







After designing your pattern and choosing colors, press CONTROL-P to create a printout with corresponding color codes that serves as a pattern for your needlework.

When you've finished creating your design, you can save a copy to disk by pressing CONTROL-F. Enter your filename (up to 15 characters) at the prompt, and the screen will be saved. After saving your pattern, the program displays the disk status on the top line. Press any key to reenter the editor. To load a previous design, press CONTROL-L. You'll be prompted to enter the filename of a pattern previously saved.

Printing A Pattern

The heart of Needlework Graphics Editor is its print option. To print a design, press CONTROL-P. The program first asks if your printer is on. Type *y* to print your pattern. The program prints a graph of your design with each of the 16 colors represented by a special symbol. For example, all yellow squares are represented by an *x*, orange ones by an =, and so on. A complete list of symbols and the colors they represent is printed below each pattern to make it easy to follow.

If you change your mind after issuing a load, save, or print command, simply press RETURN at the first prompt and you'll be returned to the editor with no action taken.

Needlework Graphics Editor has several other interesting options. Pressing @ displays the status of the disk drive. The HOME key moves the cursor to the top left corner of the screen, and CLR clears the screen. The f7 key displays a list of commands, and f8 returns you to BASIC. For a complete list of Needlework Graphics Editor's commands, see the reference table on the previous page.

Needlework Graphics Editor can be used not only for cross-stitch and needlepoint, but also for any project that requires a color graph. Just remember when designing that your video screen *represents* a horizontal to vertical ratio of 3:5 (24 lines by 40 columns), even though it is almost square. When your designs are printed, they will be in the proper 1:1 ratio, so make them a little taller than wide to compensate. Also, if your design is larger than the 24 × 40 layout of the screen, simply divide your work into sections, saving each section as you go.

See program listing on page 111.

Tile Paint For The 128

Paul W. Carlson

This creative utility adds a new function to BASIC 7.0's already impressive graphics arsenal—tile painting. With it, you can fill any portion of your screen with colorful tile-like patterns. Five demonstration programs are included to help you get the most from this useful program. For the 128 with disk drive. A color monitor is suggested.

BASIC 7.0 contains just about every graphics capability that you would normally want—with one exception. The PAINT statement does not have the option of flooding an area with a repetitive pixel *pattern.* This type of painting is often called *tile painting* or *tiling,* because the pattern repeats just like the pattern on an intricately tiled floor. Tile painting can enhance bar graphs, pie charts, and many other applications. "Tile Paint," the program accompanying this article, is a short machine language routine that makes tile painting as easy as painting with solid colors.

Because Tile Paint (Program 1) is a machine language program, it must be entered using "MLX," the machine language entry program found elsewhere in this issue. Be sure to read the instructions for using MLX before you begin entering data. When you run MLX, you'll be asked for a starting and an ending address for the data you'll be entering. The correct values for Tile Paint are as follows:

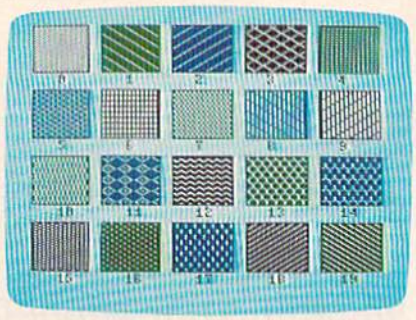
Starting address: 1960
Ending address: 1AEF

After you've entered all the data, be sure to save a copy with the filename TILEPAINT before leaving MLX because each of the five demo programs look for a file with this name.

Tile Paint creates a wedge into the BASIC interpreter which enables a new BASIC statement called TPAINT. The TPAINT statement has exactly the same syntax as the PAINT statement and is used in exactly the same way. The only difference between TPAINT and PAINT is that TPAINT paints a pattern defined by the eight bytes in memory locations 2816 to 2823.

A Demonstration

To see how Tile Paint performs, type in Program 2 and save it on the same disk as Tile Paint. When you run the program, the 20 tiling patterns that are built into Tile Paint will be displayed. Tile Paint is not limited to these patterns, however. Later we'll learn how to specify new patterns. When the display is complete, press any key to clear the screen.



Program 2, a demo, includes 20 tiling patterns.

Program 2 demonstrates some important things to keep in mind when using Tile Paint, so a brief explanation of some key parts of the program will be useful. Line 40 loads the machine language and tile patterns into memory and then skips over the subroutine in line 50. The subroutine in line 50 moves the tile pattern specified by the variable PA into memory locations 2816 to 2823, where it will be found by Tile Paint. The variable PA can have any value from 0 to 19. These values correspond to the numbers you see displayed under the patterns when you run Program 2. Any programs you write that use the patterns built into Tile Paint should contain this subroutine. Line 60 installs the wedge into BASIC, copies the BASIC paint routine from ROM into RAM, and then modifies the copy to do tile painting.

A side effect of these events is

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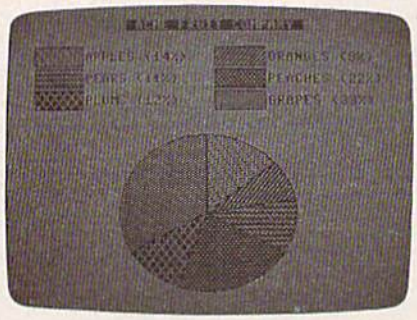
that BASIC READ statements will no longer execute properly. Therefore, when using Tile Paint, *all READ statements should occur before the SYS6656 command that installs the wedge*. Programs that need to mix READ and TPAINT statements should execute a SYS6656 statement to install the wedge just before each TPAINT statement and execute a SYS6872 statement to remove the wedge immediately after each TPAINT statement. This problem with READ statements is the reason that the wedge, unlike most BASIC wedges, is installed and removed each time a program that uses Tile Paint is run. The TPAINT statement in line 140 is immediately preceded by a GOSUB statement that moves the pattern number PA to the memory location where TPAINT can find it. Line 180 removes the wedge.

The TPAINT statement also works in high-resolution mode. Type in, save, and run Program 3 to display the tile patterns in hi-res. You'll notice that some patterns look better in multicolor mode than in high resolution, and vice versa.



Program 4, "Pie Chart," reveals some interesting possibilities.

For a practical demonstration of just how useful Tile Paint can be, type in, save, and run Program 4, "Pie Chart." Attractive displays like this are easy with Tile Paint. Notice in the program listing that the READ statement is executed prior to installing the wedge.

Your Own Patterns

You can easily place your own tile patterns into Tile Paint, either temporarily or permanently. Program 5 places new tile patterns into the examples 6 and 9 and then displays the new patterns. Every tile pattern consists of an 8 × 8 block of pixels.

128 Display Modes

Clifton Karnes, Assistant Editor

The Commodore 128 is a superb graphics machine offering six standard display modes (four for graphics, two for text), one special graphics mode, and fourteen BASIC 7.0 graphics commands.

The 128's impressive array of display modes is made possible by two video chips that produce two different video signals. The VIC II chip (8564), creates a single composite signal for all colors. This signal, which requires a composite monitor, is used for the 128's 40-column text and graphics modes. (The VIC II is the video chip used in the 64.) The 128's other video chip, the 8563, creates an RGB signal by separating the red, green, and blue colors (hence the name RGB) and sending them individually to the monitor. The RGB signal produces a sharper image than the composite signal and requires an RGB monitor. This signal is used for the 128's 80-column text and graphics modes.

Five of the six standard display modes (0–4) use the VIC II's composite signal. The two remaining modes (5 and the unnumbered, 80-column, high-resolution mode) are generated by the 8563. Here's a list of the modes with their corresponding mode numbers:

0 40-column text
1 standard high resolution
2 split-screen high resolution
3 multicolor high resolution
4 split-screen high resolution
5 80-column text
80-column high resolution

Display modes 1–4 and the 80-column high-resolution mode are graphics modes. The two remaining modes—0 and 5—are for text only. Let's take a detailed look at each mode.

40-column text. This may be the most popular mode on the 128. In addition to the usual ASCII characters, this mode offers Commodore graphics characters and custom-defined characters. All 16 colors are available for text.

Standard high resolution. This mode displays the highest composite-signal resolution the VIC II produces: 320 × 200 pixels. Two colors are available, referred to as background and foreground. This mode can be accessed with BASIC 7.0's drawing commands, and characters can be printed using the CHAR command.

Split-screen high resolution. Split-screen high resolution is the standard high-resolution mode with a text window at the bottom of the screen. The text window is useful for issuing BASIC 7.0 commands in direct mode or mixing text with hi-res graphics.

Multicolor high resolution. The multicolor high-resolution mode offers four colors, referred to as background, foreground, multicolor1, and multicolor2. In order to double the number of colors, each pixel is twice as wide in this mode as in the standard high-resolution mode. The result is a screen resolution of 160 × 200.

Split-screen multicolor high resolution. This mode is the multicolor counterpart of the split-screen high-resolution mode discussed above. It consists of the multicolor high-resolution display with a text window at the bottom of the screen.

80-column text. The 8563's RGB signal produces this mode, which displays twice the resolution of the VIC II. The character set is the same one as in the 40-column text mode, including normal ASCII characters and Commodore graphics characters. There are 16 colors available for text in this mode.

80-column high resolution. This mode is unique because it is not supported by BASIC 7.0 graphics commands. It offers the highest resolution available on the 128—640 × 200. Although the drawing commands

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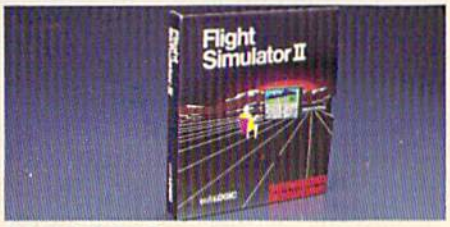

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in BASIC 7.0 can't be used with this mode, it is possible to get super high-resolution graphics by programming the 8563 chip in machine language. (See "Barricade Buster: Accessing the 128's 80-Column Screen" in the November 1987 issue for a discussion and example of this technique.)

To tell BASIC 7.0 which of the six standard modes you want to activate, use the GRAPHIC command. Its syntax is

GRAPHIC ***mode number, clear, split line***

The *mode number* is one of the six numbers (0–5) associated with each mode discussed above. *Clear* is optional and allows you to clear the graphics screen (a value of 1 clears the screen; 0 leaves the screen as it is). *Split line* is used only with the split-screen modes, 2 and 4. This parameter specifies the starting line number for the text portion of the screen. If you choose mode 2 or 4 and don't supply this value, BASIC 7.0 uses a default of 19, which allows five lines for text at the bottom of the screen.

The standard high-resolution modes (1, 2, 3, and 4) all allocate a 9K area of memory normally used for the storage of BASIC programs: $1C00–$3FFF (7168–16383). BASIC text usually starts at $1C01 (7169), but after issuing any GRAPHIC command that activates a hi-res screen, the beginning of BASIC is moved up to $4001 (16385). Giving a GRAPHIC command to move to a text mode will not deallocate this storage—that is, it will not make this area available to BASIC again. To reclaim this storage, you need to issue a GRAPHIC CLR command.

Each row of pixels can be thought of as a binary number with *on* pixels representing 1's and *off* pixels representing 0's. Both DATA statements in Program 5 define a tile pattern. The first number in each DATA statement represents the top row of pixels in the pattern, with each successive number representing the next lower row of pixels. In other words, tile patterns are defined in exactly the same way as user-defined characters.

Program 5 only temporarily modifies Tile Paint, but you can make the changes permanent. Suppose, for example, that you had run a program similar to Program 5 and then decided that you would like to have a permanent version of Tile Paint with your new tile patterns in it. This is easy to do. After running the program, all you would need to do to make a new version of Tile Paint—say Tile Paint 2, which contains the new patterns—is issue the direct command BSAVE"TILEPAINT2",B0,P6496 TO P6896.

Tile Paint cannot use all possible tile patterns, but it can use a large number of them. If you look at the tile patterns displayed by Program 2, you'll notice that nowhere in any of the patterns are there two white pixels—the background color—side by side (in multicolor mode each pixel is displayed two pixels wide). This is Tile Paint's limitation: You can't define a tile pattern that results in two side-by-side pixels not being turned on. If you do, you'll probably see the painting come to a halt and an OUT OF MEMORY error message displayed. This happens because the TPAINT routine is a slightly modified version of PAINT, and PAINT was not designed to do tile painting. This is not a serious limitation, however: There are still thousands of tile patterns you can design that will work well.

Using PAINT And TPAINT Together

You can use PAINT and TPAINT in the same program. In fact, you can first PAINT an area and then TPAINT the same area with a different color. The interaction between the two colors can produce some interesting effects, as demonstrated by Program 6. The interaction between the closely spaced blue and green pixels causes some red pixels to appear, giving the patterns an added beauty.

Tile Paint is quite powerful, especially considering how short it is. The program contains only 240 bytes of machine language and 160 bytes of tile patterns. Please note that Tile Paint uses all the memory from $1300 to $1BFF, so this area of memory cannot be used by other machine language routines.

See program listings on page 113.

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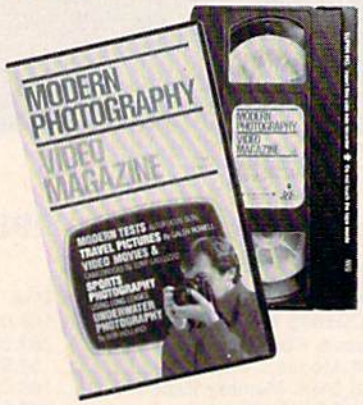

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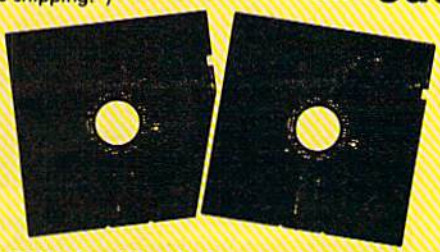

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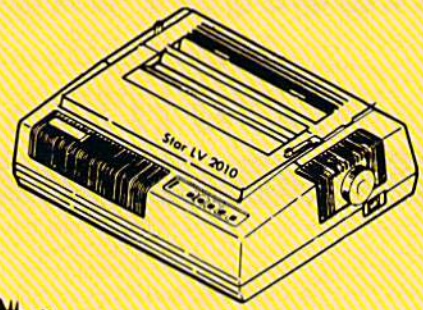

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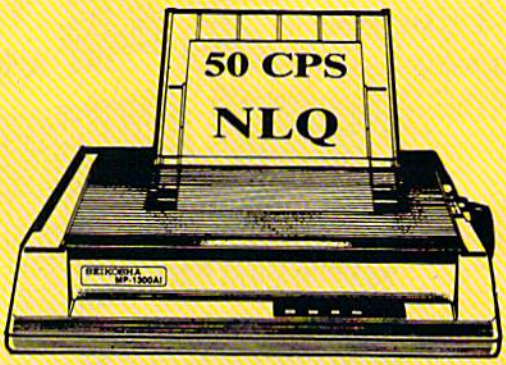

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Sound Manager

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"Sound Manager" is a powerful tool that lets you explore the intricate sound capabilities of the SID chip in your Commodore 64. And since it's likely you'll want to save your audio creations, Sound Manager lets you store 16 different sounds in one file on disk or tape. These sounds may be loaded for later editing or for use in your own BASIC programs.

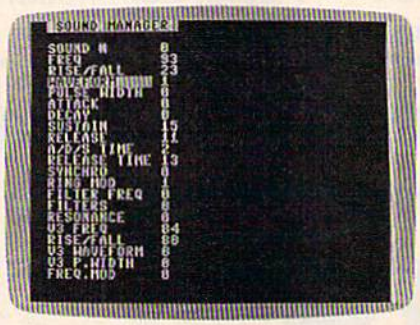
To activate one of Sound Manager's sounds from BASIC, all that's required is to POKE the corresponding sound number into memory location 2. The sounds created by Sound Manager are interrupt driven, so they operate at machine language speed, without holding up your BASIC program's operation.

Getting Started

To use Sound Manager, first type it in using "MLX," the machine language entry program found elsewhere in this issue. After loading and running MLX, respond to the prompts with the following:

Starting address: C000
Ending address: C807

After you've finished typing in the program, be sure to save a copy to tape or disk.



Create and save custom sounds for your own programs with "Sound Manager."

To get started, type LOAD *"filename"*,8,1 for disk, or LOAD *"filename"*,1,1 for tape, where *filename* is the name you used to save the program. Then activate Sound Manager by typing SYS 49152 and pressing RETURN. Sound Manager's main screen is displayed, showing the 20 sound parameters. The first parameter, SOUND #, is highlighted by the cursor. To change the values shown for each of the parameters, use the f1 and f3 function keys to move up and down through the list, and f5 and f7 to increment and decrement the values displayed. Whenever you change a value, you can immediately hear the difference in the sound.

Tailoring Your Sound

Sound Manager comes with 16 preset sounds. To hear them all, use the f5 and f7 keys to increment and decrement the current sound number. These sounds may be modified for your own use or used as is. If you wish to start with a clean slate, move to each sound parameter and decrement each value to its lowest setting. As long as you don't save the altered sounds on top of the original Sound Manager file, the initial sounds are safe.

Play with the values of the various parameters to find the exact sound that you want. Note that to get any sound at all, FREQ and SUSTAIN must be set to a value well above 0 and the A/D/S (Attack/Decay/Sustain) time should be at 20 or more. To make things easier, try modifying the preset sound that most closely matches the sound that you have in mind.

Each parameter is explained below. (For a better understanding about how each parameter affects the sound, see "Sounds And The 64," accompanying this article.)

SOUND NUMBER (0–15). Lets you define up to 16 different sounds. By changing this number, you can switch from one sound to another.

FREQ (0–255). Changing this value changes the high byte of the frequency of voice one, thus affecting the pitch of the sound.

RISE/FALL (0–254). To achieve

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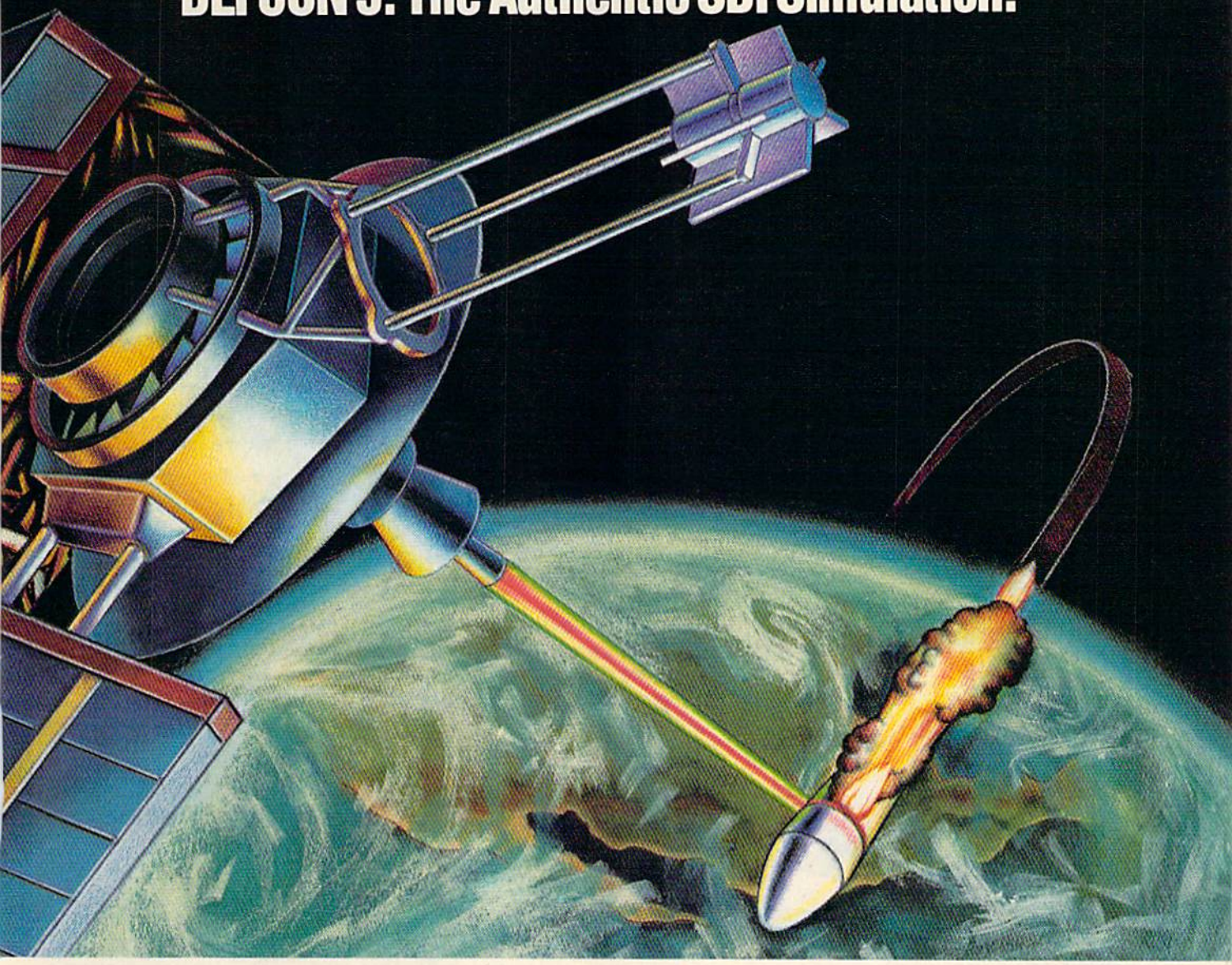

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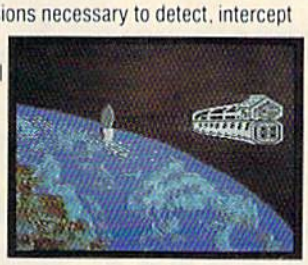

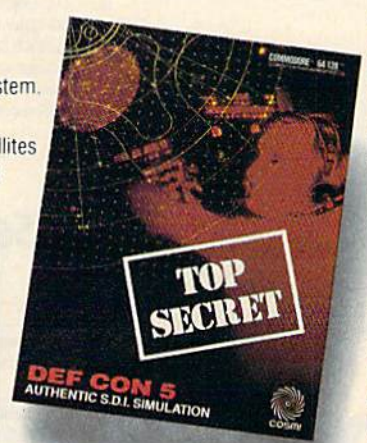

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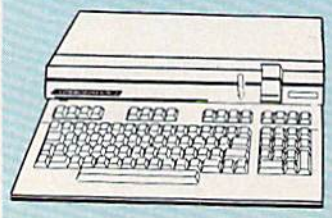

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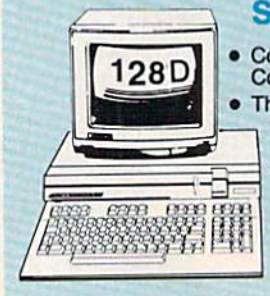

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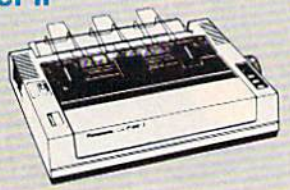

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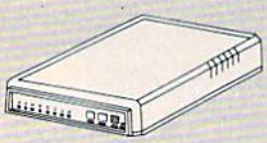

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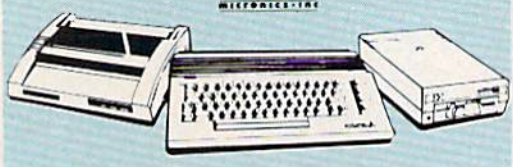

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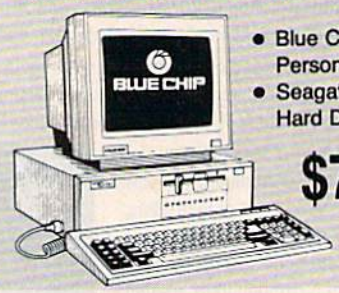

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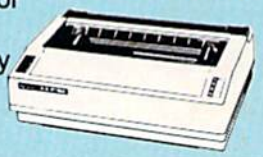

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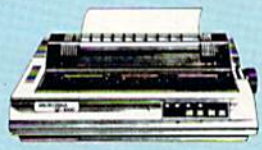

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a rise or fall effect, the interrupt routine adds or subtracts one-sixteenth of this value from FREQ every one-sixtieth of a second. An even number causes the FREQ to rise; an odd one makes it fall.

WAVEFORM (0–3). Use 0 for a triangle, 1 for a sawtooth, 2 for a pulse, and 3 for a noise waveform.

PULSE WIDTH (0–255). This determines the width of a pulse waveform.

ATTACK, DECAY, SUSTAIN, RELEASE (0–15). These four values shape the sound's envelope.

A/D/S TIME (1–254). Time in jiffies (a jiffy is one-sixtieth of a second) that the ATTACK/DECAY/SUSTAIN part of a sound lasts.

RELEASE TIME (1–254). Also in jiffies. Although you can enter values greater than 127, the release time lasts a maximum of 127 jiffies only. To calculate the actual release time for values greater than 127, subtract 128. A value of 127 or less causes the sound to repeat over and over. A value of 128 or more causes the sound play only once.

SYNCHRO (0–1). Zero is off. A value of 1 synchronizes your sound with voice 3. Voice 3 must have a frequency greater than 0 in order for synchronization to take effect.

RING MOD (0–1). Zero is off. A value of 1 turns on ring modulation. This combines the frequency of your sound with voice 3. You must use a triangle waveform in order for ring modulation to take effect.

FILTER FREQ (0–255). This value alters the high byte of the filter's cutoff frequency.

FILTERS (0–4). A value of 0 turns filters off. Use 1 for a low-pass, 2 for a band-pass, 3 for a high-pass, and 4 for a notch filter.

RESONANCE (0–15). Use 0 for no resonance and 15 for maximum resonance at the cutoff frequency (FILTER FREQ). Resonance affects the sound only if filters are used.

VOICE 3 FREQ (0–255). Same as the FREQ parameter, above, but for voice 3. Voice three is not heard. Instead it is used in frequency modulation, synchronization, and ring modulation.

VOICE 3 RISE/FALL (0–255). Same as RISE/FALL above. As with our main voice, whether voice

Sound And The 64

Randy Thompson, Assistant Editor

The SID (Sound Interface Device) chip is very versatile. It is the heart of all sound produced on the 64. With the SID chip, you can shape sounds by altering the frequency, waveform, and envelope for any of three separate voices. The SID chip can even produce special sound effects using synchronization, ring modulation, and frequency filtering. Although these terms may seem intimidating at first, with a little explanation and experimentation, you'll be turning these terms into sounds.

Frequency

Usually, when we talk about sounds, we refer to them by pitch—that is, B flat, F sharp, middle C. On the SID chip, a numeric *frequency* value determines the pitch of a sound. The higher the frequency value, the higher the pitch.

Technically, there are two, eight-bit frequency registers for each of the SID chip's three voices. With two registers, there are 65,536 possible frequency setttings, providing a wide range in frequency resolution. Appendix E in *The Commodore 64 Programmer's Reference Guide* lists the frequency values necessary for generating any note within an eight-octave range. (Note that the "Sound Manager" program allows you to change only one of the frequency registers—the most signigicant one—giving you 256 possible settings.)

Waveform

Every sound has a *waveform*, which is the shape of a sound as it passes through air. Although we cannot see a sound's waveform, we can hear it. The SID chip can create four different waveforms: triangle, sawtooth, pulse, and noise waveform.

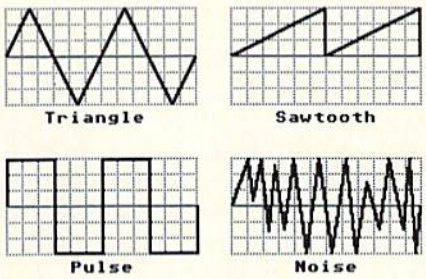

Figure 1: Waveforms

Each waveform has a unique flavor. The *triangle* wave, with its even, symmetrical shape, creates a mellow, flute-like tone. The triangle wave is closest in shape to the most basic sound wave of all—the sine wave. The *sawtooth* wave has a brazen quality, like a saxaphone. Its shape lends itself to added harmonics, making it the loudest of all waveforms available on the 64.

The last two waveforms are not often found in nature; they are of a more digital electronic nature. Like the bits in a computer, the *pulse* wave is either in an on (high) or off (low) state. Straight, rigid lines identify a pulse waveform. The sound created by a pulse waveform depends much on the *pulse width*. Depending on this width, a pulse waveform produces sounds ranging from a bright, brassy tone to a nasal, reedy buzz.

The *noise* waveform generates a random wave shape, resembling the output of a seismograph during an earthquake. The sound produced by a noise waveform is determined mainly by its frequency. A low frequency creates a low grumbling noise, while a high frequency produces an explosion-type sound.

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Envelope

A sound's *envelope* determines how a sound's volume (amplitude) is affected over time. On the SID chip, the envelope is determined by four parameters: attack, decay, sustain, and release. *Attack* refers to the rate at which a sound reaches its highest volume. The *decay* is the time it takes a note to decrease from the maximum volume to the *sustain* level. A sound stays at its sustain level until it is turned off. (Specifically, this means turning off the SID chip's gate signal for a particular voice.) The *release* time determines how long it takes for the sound to drop from the sustain level to nonexistence (zero) after the note has been turned off. The ear is very sensitive to variations in the volume of a sound, and the envelope is one of the most important ways that we distinguish different musical instruments.

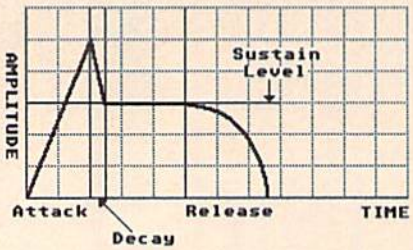

Figure 2: Envelope

Special Effects

The SID chip offers several special effects for sound creation. You can *synchronize* two voices so that their fundamental frequencies are actually in sync—the start of one frequency cycle triggers the start of the other—creating some interesting harmonic effects. *Ring modulation* mathematically combines the frequencies of two voices by outputting their sum and differences and suppressing the original frequencies. Ring modulation is primarily used for generating percussion or gong-like tones.

Each of the SID chip's voices can be modified by a programmable *filter*. As the name implies, a filter filters a sound's frequency, allowing only certain frequencies to "pass" through. The *low-pass* filter lets low frequencies through; *band pass* allows only midrange frequencies; and *high pass* lets high frequencies pass. A *notch* filter is a special case: It's the combination of the low- and high-pass filter. By blocking the midrange frequencies, a notch filter creates a hollow sound. The figure below illustrates a filter's effect on sound.

To determine just what a "high" or "low" frequency is, use the SID chip's *cutoff* register. Cutoff

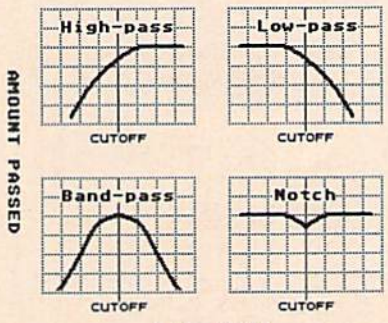

Figure 3: Filters

determines the frequency at which the filters become active. Anything lower than the cutoff frequency is considered low, and anything higher is considered high.

Resonance can be described as a filter's volume control. The higher the resonance value, the louder the frequencies close to the cutoff frequency. Resonance can be used to give filters a more drastic effect.

One special effect (not used very often) is *frequency modulation*. The SID chip allows you to read the output of voice 3's waveform. By taking this output and adding it to the frequency of another voice, say voice 1, you achieve what is called frequency modulation. When used properly, frequency modulation produces impressive results.

3 rises or falls depends on this value being even or odd.

VOICE 3 WAVEFORM (0–3). Use 0 for a triangle, 1 for a sawtooth, 2 for a pulse, and 3 for a noise waveform.

VOICE 3 PULSE WIDTH (0–255). This determines the width of a pulse waveform.

VOICE 3 FREQUENCY MODULATION (0–4). The output of voice 3 can be used to modulate voice 1 to produce even more intricate sound effects. Zero is off, and 4 selects the highest amount of modulation.

When you've made all the sounds that you need, press SHIFT-S to save your sounds to tape or disk. When prompted, enter the filename of your choice. When Sound Manager saves your sounds, it saves the entire Sound Manager program along with them. To use saved sounds, simply load the sound file just as you would Sound Manager itself. Once loaded, you may enter SYS 49152 to edit the sounds further, or you may enter SYS 49155 to activate Sound Manager without displaying the edit screen (see below).

To exit the sound edit screen, press SHIFT-Q. You'll be back in direct mode. If the current sound is still playing, enter POKE 2,16 to turn it off.

Using Your Sounds

The following lines need to be inserted into your BASIC programs to load and activate the sounds you have created:

```
1 IF L=0 THEN L=1:LOAD "filename",8,1:REM TAPE USER USE LOAD "filename",1,1
2 SYS 49155:REM ACTIVATES SOUND MANAGER WITHOUT SHOWING EDITING SCREEN
3 POKE 2,X:REM X IS THE NUMBER (1 TO 16) OF THE SOUND THAT YOU WISH TO USE
```

Filename should be the filename of a sound file that you've previously saved, or if you wish, the name of the original Sound Manager program.

Any time you want to use a sound in your BASIC program, just POKE the sound number (0–15) to location 2. Note that the sounds with RELEASE TIME set to 127 or less keep repeating, while those with a value of 128 or more sound off just once. Type POKE 2,16 to turn off any sound. (This statement also allows you to use the SID chip the traditional way, with POKEs from BASIC). POKE 2,255 to get your old sound back where you left off, or POKE any value between 0 and 15 to choose one of your other sound effects.

To deactivate Sound Manager, press RUN/STOP–RESTORE.

See program listing on page 103.

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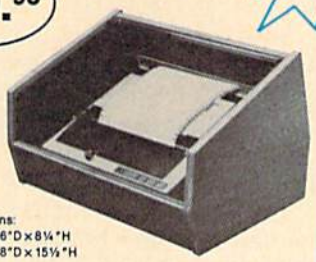

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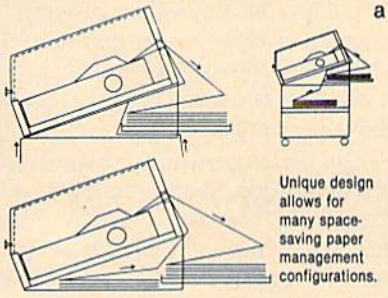
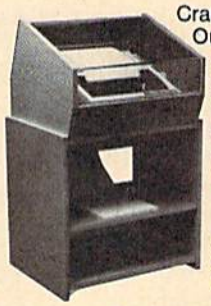
Inside 20½"W x 16"D x 8¼"H
Outside 22½"W x 18"D x 15½"H

Compare to other enclosures of similar quality and dimensions costing at least $139.95! That doesn't include "extras" like a catch-basket and a stand to raise the enclosure which are already incorporated into our design!



Unique design allows for many space-saving paper management configurations.

The "Sound Trap" is available with an optional fan to dissipate heat build-up. Integrated AC outlet and master power switch activates both printer and fan. **$49.95**



Cramped for extra space? Our optional cart is specially designed for use with the "Sound Trap". It has the same quality wood construction and casters for mobility. **$149.95**

Shipping/Handling:
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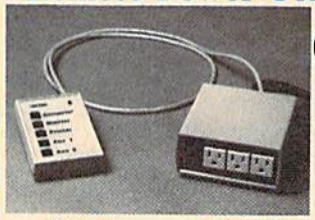

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Sprint II
A Compiler For The 64

Robert A. Stoerrle and David Penry

Here's a BASIC compiler that can make your programs execute up to 50 times faster. Written in machine language and extremely easy to use, "Sprint II" supports most Commodore 64 BASIC commands, statements, and functions. "Sprint" was first published in the January 1986 issue of GAZETTE. This updated version includes support for file commands such as OPEN, CLOSE, PRINT#, and GET#. A disk drive is required.

What's the chief complaint when it comes to Commodore BASIC? Speed, or more precisely, the lack of it. Yet the language itself is not what earns BASIC its reputation as painstakingly slow—it's the way that it's implemented. BASIC is *interpreted*. Most faster languages are *compiled*.

Whether a program in a high-level programming language is interpreted or compiled, each statement has to be translated into the machine language of the computer. With an interpreter, this has to be done every time the statement is executed. This slows down execution speed considerably. However, a compiler translates the entire program once—before execution. So, when you run the program, it executes much faster than a comparable interpreted program.

"Sprint II" is a BASIC compiler that supports a subset of BASIC statements available on the 64, including LET, FOR, NEXT, IF, POKE, PRINT, READ, DATA, and INPUT. It supports integer numbers (but no fractions), numeric and string variables, and one-dimensional numeric arrays. Sprint II also supports a wide range of functions, including LEFT$, RIGHT$, MID$, PEEK, STR$, and VAL. Unlike the original version of Sprint, Sprint II supports file operations, making it even more useful.

Typing In The Program

Sprint II is written entirely in machine language and must be typed in with MLX. After loading MLX, run it. When prompted for the starting and ending addresses, enter these values:

Starting Address: 8000
Ending Address: 97D7

Since Sprint II is a very large program, you may want to type it in more than one sitting. Be sure to follow the instructions in the MLX article to save your work between sittings, and always load up your previous work before typing further.

Once the program has been typed in and saved, it can be loaded with the following statement:

```
LOAD"SPRINT II",8,1
```

To run it, type:

```
SYS 32768
```

Using Sprint II

The first step, of course, is to write the BASIC program you wish to compile. You can do this with the normal BASIC built into your 64. If you wish, you can test the program on the interpreter first by running it. This will not always work, as Sprint II has a slightly different syntax for certain keywords.

When you're ready to compile the program, save it on disk (Sprint II compiles a program from disk, not from memory). Load Sprint II and type SYS 32768. You'll be prompted for the filename of your BASIC program. When you enter it, Sprint will proceed to compile your program. As the program is compiled, each line will be listed to the screen, followed by any error messages for the line. Note that you can stop the compiler simply by pressing the STOP key. If the compilation finishes with no errors, you can type RUN to execute the compiled program. However, if there are errors, you'll have to load the original BASIC program (the source program) and make the necessary changes.

Sprint II compiles programs from beginning to end—it does not follow GOTOs or GOSUBs, nor does it evaluate IF/THEN statements. Because of this, you can't have conditional DIMs (IF . . . THEN DIM . . .) or conditional FORs. Once a program has been compiled, there's no need for the compiler to be in memory in order to run the program; Sprint II programs are self-sufficient.

After the source program is compiled, the object program (the resulting code) will reside in memory as if it were an ordinary BASIC program. You can run and save it,

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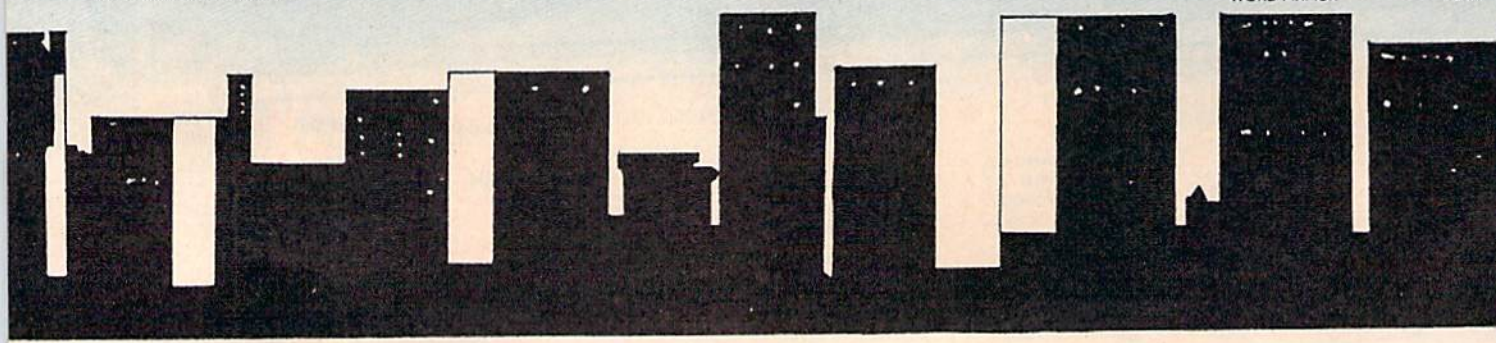

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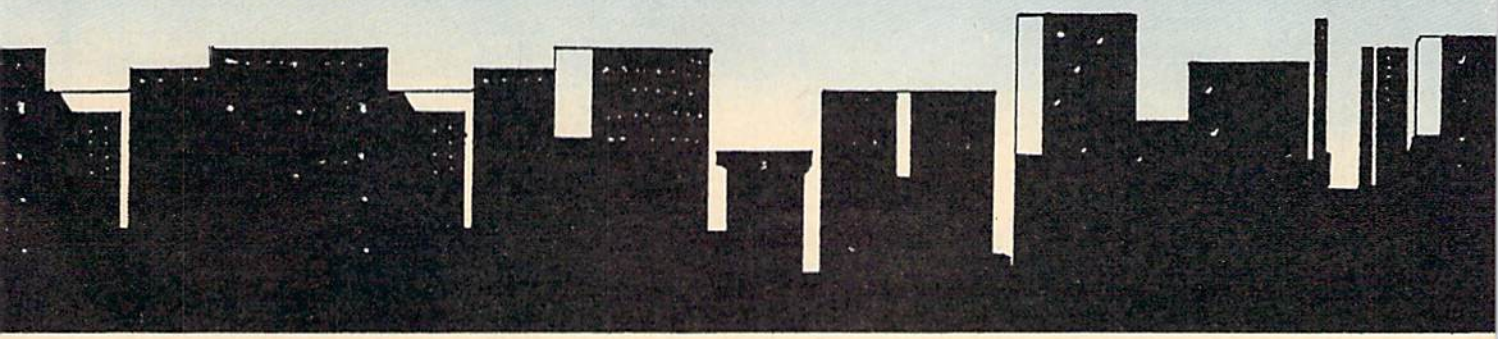

but if you type LIST, you'll see

```
10 SYS 2061
```

This is another advantage of using a compiler—people can't easily LIST or modify your program. Editing can only be done on the source program.

Constants, Variables, And Expressions

Sprint II works much the same as regular Commodore BASIC. However, there are some differences you should keep in mind when you're writing a program.

Constants are data values used in BASIC programs, such as −1, 4353, and "HELLO". Sprint II supports two types of constants: integer and string. Integer numbers are limited to −32768 to 32767. However, numbers greater than that are allowed in POKE, PEEK, and SYS statements. String constants are characters enclosed in quotation marks. The closing quotation mark may be omitted if it's at the end of a line.

Sprint II supports both numeric and string variables. Variable names may be of any length, but must not contain any *reserved words* (words that are significant to the compiler, such as POKE and THEN). Only the first 15 characters are looked at, however. Integer variables may be terminated by a percent sign (%) if desired, but all regular numeric variables are assumed to be integers anyway, since there are no floating point numbers. String variable names must be terminated with a dollar sign ($).

Strings are limited to ten characters, unless specified otherwise. If you want to include more characters, DIMension the string, as if it were an array, to the maximum number of characters it will hold. The maximum number of characters allowed in a string is 253.

In addition to integer variables, Sprint II supports one-dimensional integer arrays. Subscripts may range from 0 to 126. Arrays that are not DIMensioned are assumed to consist of 11 elements, numbered 0–10. The format for assigning, reading, and dimensioning integer arrays is identical to that for inter-

Sprint II Keywords

ABS	INPUT	RESTORE
AND	LEFT$	RETURN
ASC	LEN	RIGHT$
CHR$	LET	READ
DATA	MID$	RND
DIM	NEXT	SGN
END	OR	SPC
FOR/TO/STEP	PEEK	STR$
GET	POKE	SYS
GOSUB	POS	TAB
GOTO	PRINT	VAL
IF . . . THEN . . .	REM	

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M/L monitor accessible from a running program with resume feature intact?	Y	N
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How much RAM does the cartridge contain?	8	0
Does the cartridge work with popular multi-slot expansion boards?	Y	N
Is ALL Ram and Rom accessible from the Machine Language monitor?	Y	N
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preted BASIC, except that the subscript of a variable may not be another subscripted variable or an expression. It must be an integer constant or an integer variable.

Numeric expressions in Sprint II may contain integer constants, variables, arrays, functions, and operators. The operators supported by Sprint II are +, −, *, /, as well as the logical operators AND and OR, and the relational operators =, <, >, <>, <=, and >=. *Parentheses are not permitted.* Unlike interpreted BASIC, expressions are evaluated strictly left to right; there is no operator precedence. To get around this, you must break up the expression into several smaller expressions, and then put the results of these back together. For example, this expression:

```
SUM = A + X*Y + B + I*J,
```

becomes

```
Q1 = X*Y:Q2 = I*J:
SUM =A+Q1+B+Q2
```

Strings can be compared using the relational operators as in regular BASIC. They can also be *concatenated* (one string appended to the other) using the plus sign. Note that the result of a string expression must not be longer than the number of characters allocated for the string.

When an expression is assigned to a variable, the LET may be omitted.

Statements

A complete list of the keywords available in Sprint II appears in the Sprint II Keywords table. Most keywords function the same as in regular BASIC, except for the following:

• DATA. The DATA statement has one small idiosyncrasy: Items that include spaces must be enclosed in quotation marks, or the item will be read as if it doesn't contain a space (YOU ARE becomes YOUARE.)

• DIM. The DIM statement can only be used to declare one-dimensional numeric arrays. Multidimensional arrays are not permitted, nor are string arrays. A string is dimensioned to the maximum number of characters it will hold, like an array of numbers representing each character of the string. Only integer constants are allowed between the parentheses of variables in a DIM statement.

File Commands

•CLOSE *file number*
POKE 38705,*file number*:SYS 38710

•CMD *file number,string*
POKE 38705,*file number*:SYS 38722:PRINT *string*

•GET# *file number,variable list*
POKE 38705,*file number*:SYS 38731:GET *variable list*:SYS 38731

•INPUT# *file number,variable*
POKE 38705,*file number*:GOSUB 60100:*variable*=OP (for numeric variables)
POKE 38705,*file number*:GOSUB 60100:*variable*=OP$ (for string variables)

•LOAD *filename,device,address*
POKE 38705,0:OP$=*filename*:GOSUB 60000:POKE 38706,*device*:
POKE 38707,*address*:SYS 38813

•OPEN *file number,device,address,string*
POKE 38705,*file number*:POKE 38706,*device*
POKE 38707,*address*:OP$=*string*:GOSUB 60000:SYS 38740

•PRINT# *file number,variables*
POKE 38705,*file number*:SYS 38722:PRINT *variables*:SYS 38740

•SAVE *filename,device,address*
POKE 38706,*device*:POKE 38707,*address*:OP$=*filename*:GOSUB 60000:SYS 38764

•STATUS
SYS 38806:STAT=PEEK(38709)

•VERIFY *filename,device*
OP$=*filename*:GOSUB 60000:POKE 38706,*device*:POKE 38705,1:SYS 38813

Sprint II Error Messages

BAD FILE—Sprint II only reads program files. This error results if the filename of a sequential file is entered. This error may also happen if program line has more than 80 characters or a read error occurs.

DISK ERROR—The disk error channel is checked prior to each pass. If there is an error, it is displayed and compilation is aborted.

DEVICE NOT PRESENT—The disk drive is not connected to the serial bus, nor is it turned on.

NOT SUPPORTED—A statement that is legal in Commodore BASIC but illegal in Sprint II was used.

ILLEGAL FUNCTION USE—A function was used where a statement should have been used.

ILLEGAL STATEMENT USE—A statement was used where a function should have been used.

NON-EXISTING LINE—A GOTO or GOSUB attempts to branch to a program line that does not exist.

SYNTAX—A misspelled keyword, extra parenthesis, and so on.

TOO MANY FORS—It is unlikely that you'll ever encounter this error, as up to 19 FOR/NEXT loops can be nested.

NEXT WITHOUT FOR—A NEXT statement attempts to end a loop which does not have a corresponding FOR statement.

TYPE MISMATCH—String data was used where numeric data was expected.

COMPILATION ABORTED—Either the STOP key was pressed or an irrecoverable error has occurred (file not found, and so on).

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MISSING SEMICOLON

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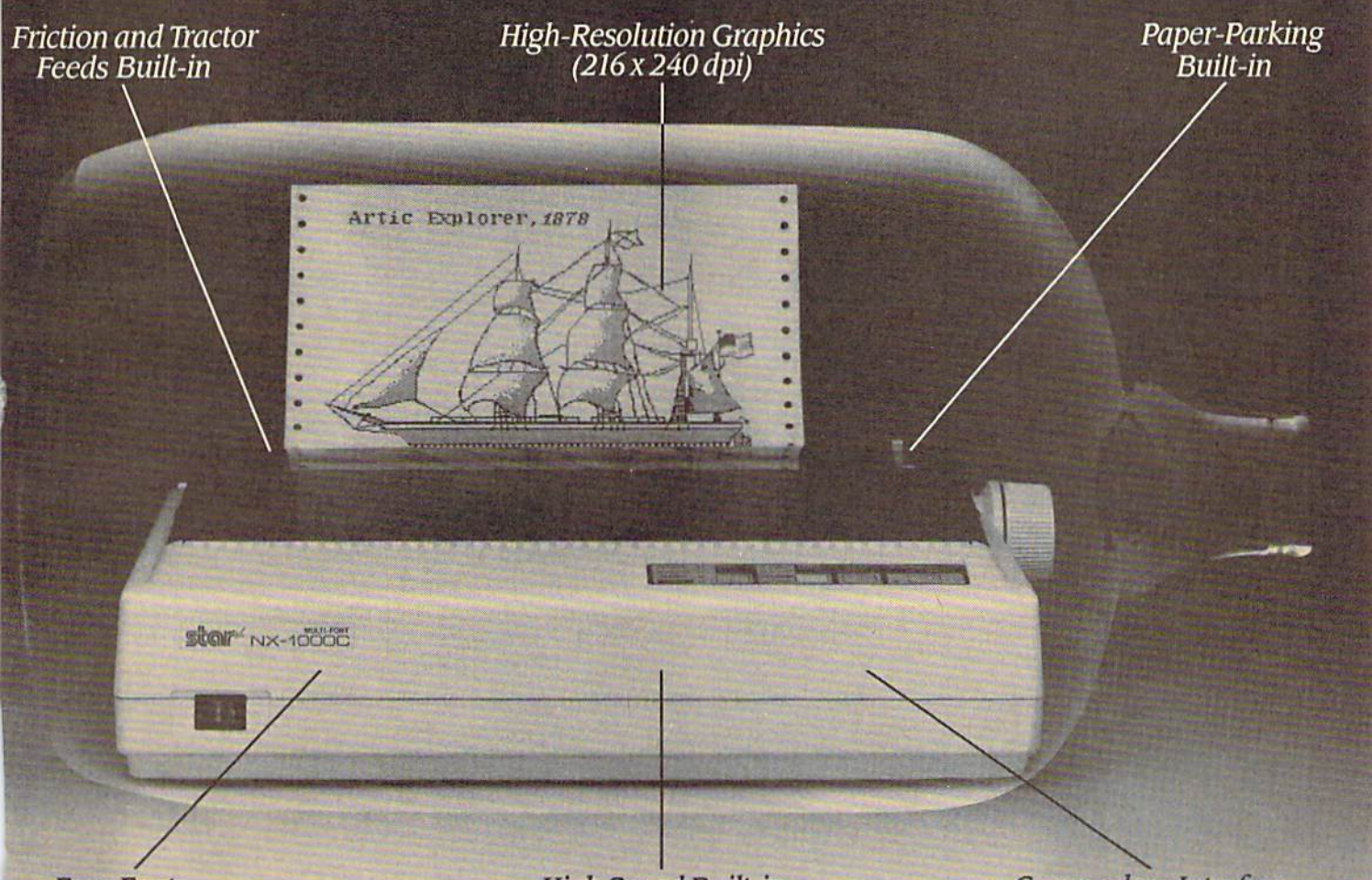
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• FOR. This statement functions the same as in Commodore BASIC, but its syntax is somewhat more particular. The TO value, and the STEP value, if specified, must be either integer constants or integer variables. Expressions are not allowed. Also, every FOR statement must have one, *and only one*, matching NEXT statement.

• GET. In Sprint II, the GET statement can be followed only by a string variable. This shouldn't be a problem, as numeric GETs are prone to errors because of nonnumeric keystrokes, and the VAL function can be used to change the string to a number.

• IF. This statement functions a bit abnormally when AND or OR is used. Because expressions are evaluated without operator precedence, the following statement will not work:

```
IF A=B AND C=D THEN ...
```

It would be evaluated as if it were

```
IF (A=B AND C) = D THEN ...
```

To get around this, you can use the following modification:

```
X = A=B:Y = C=D:
IF X AND Y THEN ...
```

The result of the comparison A=B, which is −1 for true or zero for false, is assigned to variable X. The result of C=D is assigned to Y. Now X and Y can be substituted for those comparisons in the IF statement.

• INPUT. Each INPUT statement can assign input to just one variable. In addition, all characters, except leading and trailing spaces, typed on the screen, are assigned to the variable. This includes commas, colons, and quotation marks.

Functions

Sprint II supports most Commodore functions that do not require floating point numbers. The arguments of functions must be constants or variables, not expressions. Also, note that functions may not be nested. For example, ABS(RND(0)) is illegal. The following functions work differently in Sprint II than in regular BASIC:

• RND. The RND function always returns a number ranging from −32768 to 32767, no matter what its argument is. To scale the number down to size, you can divide, using the equation:

```
Z=32767/upper range:N=RND(0) AND 32767/Z
```

The AND is necessary to insure that no negative numbers result. Sprint II gets its random numbers from voice 3 of the SID chip.

• MID$. This string function has two forms in Commodore BASIC: MID$(v$,x) and MID$(v$,x,y). Only the latter form is supported by Sprint II.

• ASC. In Commodore BASIC, using this function on a null (" ") string results in an error. This does not occur in Sprint II. Instead, a value of zero is returned.

File Operations

The first version of Sprint had no provision for writing or reading files. Sprint II adds a variety of useful file operations, making the Sprint compiler even more powerful.

Sprint II does not directly add new keywords to Sprint to handle files. Instead, you must use the File Commands table to find the equivalent commands for each file operation. As an example, the statement CLOSE 1 looks like POKE 38705,1 :SYS 38710 in Sprint II. Since Sprint II allows REM statements, it's a good idea to include one at the end of each file operation to make your programs more readable. Here's an example: POKE 38705,1 :SYS 38710:REM CLOSE 1.

If you use these file operations in a program, you must also append the lines from Program 2 to the end of your program. In addition, you must add the line DIM OP$(253) to the beginning of your program.

Error Messages

Sprint II has many error messages that make it easier to debug programs. However, only certain types of errors can be flagged during compilation. Sprint II catches errors such as data type mismatches, NEXT without FOR, and so on. Errors such as overflowing numbers and running out of DATA items cannot be flagged during compilation because they occur during execution of the actual compiled program. In these cases it will be harder, but not impossible, to debug programs.

Sometimes, an error earlier in the program leads to another error later on. For example, if there is an error in a FOR statement, the compiler will act as if that FOR does not exist. Because of this, the corresponding NEXT statement will cause a NEXT WITHOUT FOR error message. You'll have to use your judgment to weed out these extraneous messages. Note that you should *never* attempt to execute a program with even a single error in it.

See the Sprint II Error Messages table for more details.

The Speed Of Sprint II

I ran several test programs through the compiler to determine the speed of Sprint II. Results varied according to the type of program. The compiled test programs ran 15 to 50 times faster than Commodore BASIC. A program to sort 100 numbers took over two minutes in Commodore BASIC, but the compiled version executed in only five seconds.

For demonstration purposes, I've included a sample program. Type in Program 3, "Doodler," and run it, noting the speed with which it executes. Now, save, compile, and run it again. Notice the difference?

See program listings on page 107.

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ScrollEdit
A Scrolling BASIC Editor

David R. Van Wagner

Programmers will appreciate this powerful utility for the Commodore 64 which lets you scroll up and down through program listings with the press of a function key—no more typing and retyping LIST. "ScrollEdit" is compatible with "MetaBASIC."

Whether you're programming or debugging, you spend a lot of time listing various parts of your program. In BASIC, listing is done with the LIST command. It's a versatile command—it allows you to list the entire program (LIST), list any range of lines (LIST 10–100), list all lines up to a given line number (LIST –200), and list all lines starting with a given line number (LIST 300–).

As flexible as the LIST command is, there's a better way. "ScrollEdit" doesn't demand any typing at all—one keypress lets you scroll through the entire program. Press another key and you can scroll through the program in the other direction. Stop the scrolling whenever you wish, fix a bug, and continue.

ScrollEdit was designed to be compatible with "MetaBASIC" (last printed in the February 1987 issue of GAZETTE, and currently in the special issue, *The Best of COMPUTE! and GAZETTE*). The two utilities make a great debugging team.

Getting Started

For speed and versatility, "ScrollEdit" (Program 1) is written in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, when you enter the program. Run MLX. When you are prompted for a starting and ending address, respond with the following values:

Starting Address: 0801
Ending Address: 0CD0

Be sure to save a copy of the program to disk or tape before exiting MLX.

Program 2, "MetaScroll," loads and installs both MetaBASIC and ScrollEdit. You must have a disk drive if you wish to use this program. Type it in and save a copy to disk. Before running the program, make sure that your copy of MetaBASIC or MetaBASIC Plus has the filename METABASIC and that ScrollEdit has the filename SCROLLEDIT.

If you wish to use ScrollEdit in conjunction with MetaBASIC, load and run MetaScroll. Otherwise, load and run ScrollEdit (it loads and runs like a BASIC program).

One-Key Scrolling

To test ScrollEdit, load a BASIC program. ScrollEdit has only one requirement for use: There must be at least one line listed on the screen for it to work. To get this line on the screen, you can type LIST *n*, where *n* is any line number in your program. Alternatively, you can just type a line number on the screen and place the cursor over it (but be careful not to press RETURN on this line). Now press f1 to scroll upward through the program. To stop the scrolling, release the key. Pressing f7 scrolls the screen in the other direction.

All the usual screen editing features of the 64 work normally with ScrollEdit. If you edit any lines, be sure to press RETURN on those lines.

To make editing even easier, ScrollEdit adds new editing features. Whenever you want to open up space in the middle of a listing, position the cursor and press CTRL–INST/DEL. This key combination inserts an empty line between any two lines listed on the screen. Cursor movement commands have also been added. Press CTRL–Cursor Down to move the cursor to the lower-left corner of the screen. Press f3 to move to the beginning of any line. Move the cursor to the end of any line by pressing f5.

ScrollEdit can be disabled by pressing CTRL–RETURN. You'll need to do this any time you want to use the function-key definitions of MetaBASIC. Press CTRL–RETURN again to reenable ScrollEdit. Because the program changes the NMI vector, MetaBASIC's default command cannot be used to set screen colors. However, it may still be used to set the default device number for loads and saves.

ScrollEdit can be used with "The Automatic Proofreader," but you must be sure to load and run ScrollEdit *before* the proofreader.

Technical Considerations

ScrollEdit changes the keyboard decoding ($28F), IRQ ($314), NMI ($318), and BASIC entry ($302) vectors. The new keyboard decoding routine does most of the work regarding moving the cursor and scrolling the BASIC listings when f1 and f7 are pressed. The IRQ routine checks memory location $CB (current key pressed). If a function key value is there and ScrollEdit is on, the value is changed to 64 (no key pressed) so that MetaBASIC's macro key definitions won't interfere with the scrolling listing. The new NMI routine keeps ScrollEdit active when RUN/STOP–RESTORE is pressed. The new routine pointed to by the BASIC entry vector which accepts entries from the keyboard now tells ScrollEdit that it is in direct mode so that it may respond to function keys or the added control-key sequences. It also ensures that all of the other vectors are correct.

See program listings on page 114.

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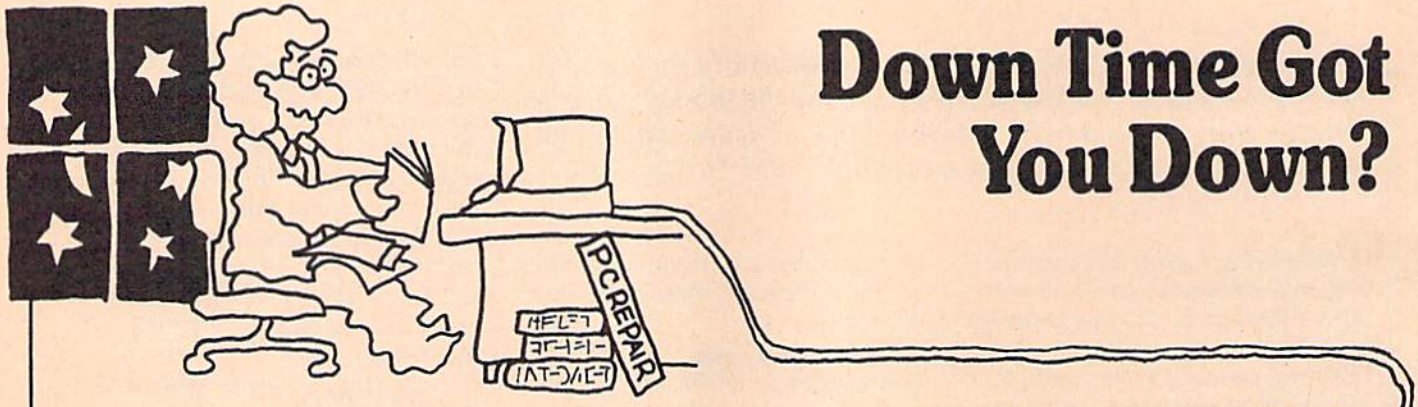

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Condensed Font

Richard Penn

Add a condensed font to your Commodore MPS-801, 803, or 1525 printer with this utility that prints up to 120 characters per line in either normal or reversed mode. Versions are included for the 128, 64, Plus/4, and 16.

If you use your printer often, sooner or later you'll want to print something in condensed type. Maybe you'll need to print a spreadsheet that's 120 columns wide, or you'll want to squeeze more information on a page, or maybe you'll just want to add a different look to your correspondence. "Condensed Font," the program accompanying this article, allows a Commodore MPS-801 (1525 and MPS-803 as well) or compatible printer to print condensed letters in both normal and reversed modes and is easy to use.

To get started with Condensed Font, first type in Program 1. This portion of Condensed Font is the same for all computers—128, 64, Plus/4, and 16. Then type in the section that is customized for your particular machine. Commodore 64 users should continue typing with Program 2, 128 users with Program 3, and Plus/4 and 16 owners with Program 4. When you've typed in both listings, save a copy of the program to disk or tape. Condensed Font is written in machine language (ML) in the form of a BASIC loader, so just type RUN to install the ML routine, and then type NEW to remove the loader from memory.

How To Use It

Condensed Font prints condensed versions of the characters from ASCII 32 to 95 decimal, which are as follows:

```
!"#$%&'( )*+,-./0123456789:;
 <=>?@ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[£]↑←
```

The graphics characters above ASCII 95 are printed in normal mode, and the control codes below ASCII 32 are handled in the usual way.

To enable and disable Condensed Font you must use SYS commands. Here are the values for each computer.

	Enable	Disable
64	SYS 50000	SYS 50120
128	SYS 5100	SYS 5220
Plus/4, 16	SYS 16128	SYS 16248

Condensed Font uses the same control codes as your printer for reversed mode printing. CHR$(18) turns on reverse mode and CHR$(146) turns it off. Here's a short demonstration program for the 64 that will print the condensed character set in both normal and reversed modes. (Commodore 128, Plus/4, or 16 users should change the values of the SYS commands in lines 10 and 30 to those for your machine.)

```
10 SYS50000:OPEN1,4:FORX =32
   TO95:PRINT#1,CHR$(X);:NEXT:
   REM NORMAL PRINT
20 PRINT#1:PRINT#1,CHR$(18);:
   FORX=32TO95:PRINT#1,
   CHR$ (X);:NEXT:REM REVERSE
30 PRINT#1:CLOSE1:SYS50120
```

Please note that Condensed Font must always be disabled before printing to the screen, tape, or disk, or the results will be unpredictable.

Let's print a program listing in condensed font. With the BASIC program you want to list in memory, type the following on the 64 (again, supply your own values if you're using a 128, Plus/4, or 16):

```
SYS50000:OPEN1,4:CMD1:LIST
```

followed by

```
PRINT#1:CLOSE1:SYS50120
```

Program Notes

Program 1—the part of Condensed Font that is common to all machines—loads the condensed character set into memory. Although the character set is not stored in the same memory location in each computer, the set itself is the same. The program determines which machine you're using and decides where to store the character information.

The second half of Condensed Font—Program 2, 3, or 4 depending on which computer you're using—is a BASIC loader. It installs an ML wedge that patches into the CHROUT vector. Each time a character is output, control is diverted to the ML wedge, which looks at the character and prints either its condensed representation, or, if it's outside Condensed Font's range, its normal one.

See program listings on page 110.

SpeedScript Justified

Larry D. Smith

Add a professional look to your SpeedScript *documents with this utility that adds right-margin justification. It works with the Commodore 64 version of* SpeedScript 3.0 *or higher or* SpeedScript 128. *A disk drive is required.*

One of the least common, yet most desired features found in a word processor is right justification. Right-justified text lines up evenly along the right margin. Most magazines (including this one) and newspapers use justified text because it looks neater, is easier to read, and is more pleasing to the eye.

Like most word processors, however, *SpeedScript* does not offer a right-justified print option. "*SpeedScript* Justified" remedies this situation. The program reads *SpeedScript* files that have been printed to disk and outputs a right-justified copy to the printer.

Typing It In

SpeedScript Justified is written partly in BASIC and partly in machine language. The machine language is stored as DATA statements and is POKEd into memory by the BASIC program. Entering *SpeedScript* Justified requires accurate typing, so be sure to use the "Automatic Proofreader," found elsewhere in this issue. After entering the program, be sure to save a copy to disk.

Activating It

Load and run *SpeedScript*, and then type in or load a text file. *SpeedScript* Justified allows you to specify which sections of your text are right justified. By default, *SpeedScript* Justified prints files *without* right justification. Instead, you must activate right justification from within the file.

Activating right justification is just like activating bold or underline mode—you use a special format key. The format key for right justification, however, must be defined by you. To do so, go to the top of the file, press CTRL-3; type the digit 1, an equal sign (=), then the digit 1 again; and then press RETURN. You have just defined format key 1 to be equal to CHR$(1), which is the control character that tells *SpeedScript* Justified to print right-justified text.

In order to turn off justified mode, you must define a format key with an ASCII value of 2. Move the cursor just below the previous format key definition; press CTRL-3; type the digit 2, an equal sign, then digit 2 again; and then press RETURN. You must define both of these format keys in every file with which you want to use *SpeedScript* Justified.

Let's suppose that you want all of your text to be printed right justified. Move the cursor to the beginning of the first line of text, press CTRL-3, and then 1. (This format code must appear *after* the format key definition.) This places the justification code in your text.

SpeedScript Justified does not try to justify short lines that begin on the left margin. But if you have a short line that begins at the center of a line (the date or your name in a letter, for example), it will be justified. To prevent this from happening, you may want to turn off justification in certain sections of your document. If you wish to have certain sections of your text file unjustified, move the cursor to the beginning of the first line of text to be unjustified and press CTRL-3 followed by the digit 2. This inserts the justification *off* code. If you do this, however, you must insert format key 1 later in your document to reactivate right justification.

Creating A Right-Justified File

Now that you have defined and inserted format keys to toggle right justification on and off, it's time to create a disk file that can be printed by *SpeedScript* Justified.

To convert your document into a file that *SpeedScript* Justified can read, print your text to disk by pressing SHIFT-CTRL-P, and then pressing D for disk. When prompted, enter the filename of your choice. It's a good idea to use a filename that's different from that of your *SpeedScript* file.

Before exiting *SpeedScript*, make note of your margin settings: You'll need to know them in order to print a right-justified document. If you did not set them yourself, remember that *SpeedScript* uses default settings of 5 for the left margin, and 75 for the right margin.

Files printed by *SpeedScript* Justified can have only one margin setting for the entire document.

Printing A File

To print the disk file, load and run *SpeedScript* Justified. Be sure that the disk containing your file is in the drive identified as device 8. After a brief delay, the program prompts you for a filename. Enter the filename used when you printed your text to disk. Next, you are asked to enter the left and right margins. Enter them on the same line with a separating comma. For example, to input a left margin of 5 and a right margin of 75, enter the following: **5, 75**.

Once the filename and margins settings are entered, *SpeedScript* Justified sends your document to the printer in justified format. You may abort the printing by holding down the RUN/STOP key until the printer stops. To print another copy, simply rerun the program.

To right justify lines, *SpeedScript* Justified strategically inserts spaces within the text, making all lines equal in length. The maximum number of spaces that *SpeedScript* Justified inserts is 16. If a line ever requires more than 16 spaces, that line will not be properly justified. If this ever happens, try changing the 16 in line 1040 to a higher number—say, 24. Also, *SpeedScript* Justified does *not* work with double-width characters. Such extra-wide characters only confuse the program.

See program listing on page 107.

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machine language programming

The Native Tongue

Jim Butterfield, Associate Editor

Longtime Commodore users will need no introduction to Jim Butterfield. For those of you new to the community, Jim has for years been one of the most respected authorities on Commodore software, hardware, and programming. From the first issue of GAZETTE in 1983, I've written a column called "Machine Language for Beginners." With this issue, I turn the column over to Jim. I know of no author more qualified to write on the subject.

—Richard Mansfield

Welcome to the world of machine language. The material in this column will cover a broad range. Some of it will be at beginner level, some advanced. Sometimes the column may concentrate on a specific machine, such as the Commodore 64, but most of the time it will deal with all of the Commodore eight-bit machines. The material will not be sequential in nature, but rather, a range of topics will be covered.

Machine Language

Let's talk about the term *machine language*, or ML. What does it mean? It means just what it implies: the language of the machine itself. Often, the term *machine code* is used to mean the same thing. Whatever term you use, you're working with the inner fabric of the computer. With ML, you get to see (and use) secrets that BASIC programmers won't know. In some ways, you feel like a mechanic, tinkering with the machine's innards.

ML is good for machines, but it's not optimum for humans. The computer uses *bits*, each of which is either "on" (1) or "off" (0), and reading bits can be tedious. I might correctly state that the command to move data from the processor's accumulator register into address 53281 is 10001101 00100001 11010000, which is literally true, but almost unreadable to us humans. We can make the same statement more human-readable by expressing the bits in hexadecimal, in which case the command is shown as 8D 21 D0. Each hexadecimal digit—a single number or letter—stands for four binary bits. Hexadecimal's more compact form might save us writer's cramp, but few would find it easily readable.

Assembly Language

In our search for readability, we might take the command 8D 21 D0 and—knowing that hex code 8D corresponds to the command "store accumulator"—represent it as STA $D021. STA, as you may have guessed, is the standard abbreviation for STore Accumulator. Often, such abbreviations are referred to as *mnemonics*—a means to help us remember ML.

The dollar sign ($) prior to the D021 means that what follows is a hexadecimal number. Notice that the last two bytes in 8D 21 D0 have flipped over, giving us the address D021. By using a conversion table or calculator, we can translate $D021 into the decimal number 53281. Now, we may rewrite our command as STA 53281.

Let's go one step further. Suppose that we wish to refer to address 53281 as BACKCOLOR (address 53281 on the 64 controls the background color of the screen); I could now write STA BACKCOLOR to represent the instruction. A term such as BACKCOLOR is often called a label or symbol.

By using mnemonics, decimal numbers, and labels, we've reached a point where the instruction is almost as human-readable as "store the accumulator into address 53281." And, believe it or not, we've also left ML behind. What we now have is called *assembly language*—technically not ML, but the next closest thing. You will find, however, that most ML programs are written in assembly language, and then converted to machine code through the use of an assembler. Because of this, ML—the actual bits and bytes understood by the machine—is often referred to as assembly langugage.

Why Machine Language?

If all these helpful translations make it easier for us humans, why bother with ML at all? There are a few good reasons. First of all, ML is what the machine itself uses. There are times that we need to strip everything down to the bits and see *exactly* what that machine is doing. When you get into testing and debugging, you often need to work at that level of detail.

The more human-oriented languages are, the more they tend to detach you from the machine. It's harder to estimate things such as memory usage without cutting through the intervening levels produced by interpreters and compilers. I believe that you write better programs—even in high-level languages such as BASIC—when you know the instructions that actually make the computer work.

Machine Language, Commodore Style

On some computers, you're almost *denied* access to ML: You don't know where the program will go into memory, you don't know if it will be fragmented into many parts, and you don't have easy access to the final code. Such machines are terrifying for the beginner. You must accept so much on faith, trusting that some sort of code will find its way into the machine to do the desired job.

That's what I like about the eight-bit Commodore machines: You have direct access to the machine code, you know where your code is, and you generally know how things work. You can get in touch with the machine.

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BASIC for beginners

Unstructured Programming

Larry Cotton

[Ed Note: Structured or unstructured programming? Which approach is best? Prompted by a letter from a reader, we decided to ask two of our crack columnists to present arguments for each approach. In this column, Larry Cotton speaks out for unstructured programming. Immediately following, Todd Heimarck argues for structured programming in his "Horizons" column.]

Structure in programming suggests, but is not limited to, indention of program lines for easy readability, logical organization, well-documented code, and the breaking down of a program into small modules or subroutines. We've talked about programming style before—especially in regard to a program's elegance. And since I think structure usually restricts that elegance, as well as other characteristics of a good program, I favor the more flexible advantages offered by unstructured programming.

Structure And BASIC

BASIC isn't exactly the structured programmer's language of choice—far from it. In fact, it's difficult to offer meaningful examples of structured programming in BASIC. Nevertheless, here's how a simple nested FOR-NEXT loop looks in a structured BASIC program:

```
10 FOR  I = 1 TO 5
20 :        FOR  J = 1 TO 3
30 :             PRINT I, J
40 :        NEXT J
50 NEXT I
```

There are various important elements of a structured program. One of them is line indention, which is usually used to clarify organization and flow. BASIC, however, doesn't require any indention. In fact, Commodore BASIC makes it quite difficult. In Commodore BASIC, you must type a colon after the line number to keep the computer from stripping off leading spaces when a line is entered.

Now let's look at the same nested FOR-NEXT loop in unstructured form:

```
10 FOR I=1 TO 5:FOR J=1 TO 3:PRINT
   I, J:NEXT J:NEXT I
```

Does separating and indenting each command really make this code more readable? It seems to me that this line illustrates the program's flow just as well as the structured version. It's easy to tell that the J loop is nested within the I loop, simply because it is *surrounded* by the FOR I and NEXT I instructions.

The Structured Mind

Another element required by structurists is organization. Now I don't want you to disdain organization. Indeed, when you write longer programs, organization becomes a must. However, don't let organization inhibit originality and creativity in your BASIC programs.

Some structural programmers organize their programs to the hilt. Each activity is reduced to the sim-

```
10 PRINT CHR$(147): REM CLEAR SCREEN
20 POKE 53280, 0: POKE 53281, 0: REM BLACK BORDER AND BACKGROUND
30 R = 54272: REM ADD TO SCREEN FOR COLOR MEMORY LOCATION
40 M = 2023: REM MAX. SCREEN LOCATION
50 A = 1: REM USED FOR RND STATEMENTS AND IN INCREMENTING
60 C = 40: REM NO. OF SCREEN COLUMNS
70 W = 10: REM MAX. BLOCK WIDTH AND LENGTH
80 S = 160: REM SPACE
90 CL = 15: REM HIGHEST COLOR CODE
100 NL = 1000: REM NO. OF SCREEN LOCATIONS
110 SL = 1024: REM STARTING SCREEN LOCATION
120 FOR X = A TO 10: REM NO. OF BLOCKS TO PAINT
130 :     N = INT (W * RND (A)) + A: REM RANDOM BLOCK WIDTH FROM 1 TO 10
140 :     Q = INT (W * RND (A)) + A: REM RANDOM BLOCK LENGTH FROM 1 TO 10
150 :     CO = INT (CL * RND (A)) + A: REM RANDOM BLOCK COLOR FROM 1 TO 15
160 :     V = INT (NL * RND (A)) + SL: REM RANDOM LOCATION UPPER LEFT-HAND CORNER
170 :     CK = V + (C * Q): REM LOCATION OF LOWER RIGHT-HAND CORNER OF BLOCK
180 :     IF CK > M THEN GOTO 160: REM CHECK TO BE SURE IT DOESN'T GO OFF SCREEN
190 :     FOR  Y = 1 TO Q
200 :          FOR  Z = 1 TO N
210 :               POKE V + A, S
220 :               POKE V + A + R, CO
230 :               V = V + A
240 :          NEXT Z
250 :          V = V + C - N
260 :     NEXT Y
270 NEXT X
```

plest subroutine, which resides neatly in just one or two lines. On the other hand, free spirits rip right into their programs—first things first and let the rest of the program incur the consequences.

A hallmark of a truly unstructured program is a plethora of GOTO statements, which causes structurists to recoil in horror. If you're not careful, however, GOTO's can weave a tangled web in which even the programmer can get lost. Therefore, particularly on this issue, I have to side with the structurists: It's always preferable to use GOSUB and RETURN instead of GOTO.

Comments

Another basic feature of structured programs is that they are usually heavily commented. The only way to accomplish this in BASIC is with the REM statement.

Let's compare an indented, commented program with its super-compact, unstructured counterpart. Our example program, "Mondrian," is written for the Commodore 64, and is listed at the bottom of the previous page. Don't bother to type the structured version in—it's simply for study.

Now here's a super-crunched, unstructured version of the same program. If you have a 64 or 128, you may want to enter and run this version. It's fun to watch.

```
10 PRINTCHR$(147):POKE53280,0:POKE
   53281,0:R=54272:M=2023:A=1:C
   =40:W=10:S=160
20 CL=15:NL=1000:SL=1024:FORX=
   ATO10:N=INT(W*RND(A))+A:Q=
   INT(W*RND(A))+A
30 CO=INT(CL*RND(A))+A:V=INT
   (NL*RND(A))+SL:CK=V+(C*Q)
   :IFCK>MTHEN30
40 FORY=1TOQ:FORZ=1TON:
   POKEV+A,S:POKEV+A+R,CO:V=
   V+A:NEXT:V=V+C-N:NEXT
   :NEXT
```

The above example clearly illustrates how much structured programs can be compressed. Since structured programs are longer, they are characterized by a voracious appetite for memory; they also use a lot of disk space. As you can see, the unstructured program is only four lines long and, if saved to disk, uses only one block of valuable disk space. The structured version uses five blocks. Also, if you enter and run both programs, you'll appreciate how much faster the unstructured version executes.

Other Restrictions

Indention, breaking down the program into small modules, and comments are just some of the structural attributes which restrict creative programming. There are several other things structural programming restricts:

1. Speed of the programming process: Obviously a four-line program is much quicker to enter and test than its structured counterpart. (OK, I admit that debugging might prove a bit more difficult.)
2. Elegance: Hard to quantify this one, but structured programs aren't known for their elegance and unique style.
3. Creativity: I can't help but believe that over-concentration on a program's structure hobbles creativity. A programmer should be able to program as fast as he or she can type—a stream of ideas flowing unrestrained by worries of subroutines, indention, remarks, modules, and whether fellow programmers can understand or modify his or her work.

Good programming probably lies between the two extremes presented here. Does the program work well? Is it fast where it needs to be fast? Does the program look good? Does the user enjoy using it?

When you need speed, you'll probably have to crunch programs, and use other possibly unstructured tricks as well. When you're in a situation where you must be able to remember or show what each line does, sprinkle your program with REMs. I'm sure that structurists and nonstructurists alike agree that good programs must be well organized. Above all, don't let a program's structure cause you to compromise on its operation.

Next month, we'll get back to BASIC with one of its most entertaining commands—RND.

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Todd Heimarck
Assistant Editor

Larry Cotton's "BASIC for Beginners" column, on the preceding pages, makes a good case against structured programming. However, he does concede some points—especially when he says good programs are well organized. This suggests that imposing some sort of structure on a program is valuable.

A letter from Steve Litwok, head of the department of computer science at a high school in Jordan Valley, Israel, triggered this debate. Mr. Litwok objected to an answer in the April 1987 "Gazette Feedback" column which presented some arguments against structured programming—at least for type-in programs that appear in a magazine such as COMPUTE!'s Gazette. For one thing, heavily commented and indented listings take up valuable magazine space. A second problem is that, on Commodore machines, programs that contain many REMs generally run more slowly than their compact multistatement counterparts. A third consideration is that most of the program submissions we receive are unstructured. It's how most people write Commodore BASIC programs.

A Brief History

BASIC, especially the implementations you find on microcomputers such as the 64, is widely regarded as an unstructured language. It first appeared at Dartmouth College in the early 1960s, where it was introduced as an English-like, interactive programming language well-suited for teaching beginners. The fact that it's interactive is important. With BASIC, you can type a few lines, run the program, make some changes, test it out again, and so on. Some people develop a programming style of tinkering and tweaking until the program runs correctly.

Around 1970, computer science experts started discussing the new idea of structured programming. After some debate, the consensus emerged, at least within the field of computer science, that structure is a good practice to encourage. Pascal was one of the first widely popular languages to adopt an aggressive prostructured approach.

Keeping a historical perspective, you must remember that at the time that the academic community equated *unstructured* with *bad programming style*, probably 99 percent of the world's programmers learned how to program in a college setting. If you learned how to write software, you learned structure. Everybody agreed that it was the way to program.

In the late 1970s and early 1980s, something happened. Low-cost microcomputers from Commodore, Apple, Radio Shack, and other companies made home computing affordable. Most personal computers came with BASIC—the language invented before structured programming. Most computer owners learned BASIC from books, magazines, or friends—outside of an academic environment. Suddenly there were millions of people happily writing unstructured programs. Computer scientists were aghast.

A Small Plate Of Spaghetti

What is structured programming? How do you write a structured program? Before getting into what it is, let's look at what it is *not*.

```
10 A=1: GOSUB 512: GOSUB 99:
   GOTO 30
20 IF B$="QUIT" THEN 40
30 ON Z GOTO 10, 80, 630
40 FORQ=1TO500:POKE
   SCREEN+Q,H(Q)
50 IF Q>LIMIT GOTO 70
60 NEXT:GOTO 90
70 GOTO 400
```

The first thing you notice in this program fragment is a lot of GOTOs, a sure sign of disorganized programming. Line 10 jumps around line 20 to reach 30 and line 20 (in between 10 and 30) jumps around 30 to 40. What is the purpose of line 20? It might be that it's a remnant of a previous experiment, now just taking up space. Or maybe some other line, later in the program, does a GOTO 20. But if that's true, you could easily clean it up a little and avoid GOTOs hopscotching over other GOTOs.

You almost never need unconditional jumps (naked GOTOs) in a program. Conditional branches such as IF-GOTO or ON-GOTO are fine. Temporary branches (GOSUBs) are also acceptable. A program that is chock-full of unconditional GOTOs is often called *spaghetti code*, because tracing through it is like trying to separate strands of interwoven pasta.

Line 50 is especially bad. It's an IF-GOTO conditional branch, which would be fine except that where it goes is a line that does another GOTO. Why would you ever send a GOTO to another GOTO? The program goes off on a time- and memory-wasting spaghetti hunt for a line that does something. What's doubly bad about line 50 is that it jumps out of a FOR-NEXT loop, which will eventually lead to an OUT OF MEMORY error because of garbage building up on the stack.

If you were a teacher and one of your students turned in a program that looked like this, what kind of grade would you assign? It's definitely not an A+ project.

Defining Structure

Let's propose two general rules of structured programming, both of which relate to coding style. The first rule is that when you program, you should be organized and separate the program into bite-sized sections. The second rule is that you should write programs that are easy for other people to read.

The first is the most important

rule. It's sometimes called *modular programming*. As you write a program, you split it up into modules or subroutines. Instead of running straight through from line 10 to line 5000, divide it up. Replace the mammoth 500-line program with five 100-line routines, each of which in turn has about five 20-line routines.

As mentioned previously, you can usually write programs to avoid unconditional GOTOs. In languages like C or Pascal you can create huge programs that never once use a GOTO. BASIC 7.0 for the 128 is another example. With the IF-THEN-ELSE option, IF-THEN-BEGIN blocks, and the powerful DO-LOOP construction (which can handle WHILE and UNTIL at either end of the loop and EXIT anywhere in the middle), you should never need GOTO in 128 mode. In BASIC 2.0 for the 64, you sometimes can't avoid GOTOs. But you can at least use them sparingly.

If being organized means imposing a logical structure, then making a listing easy to read means imposing a physical structure. The key idea is to do a few things to help the reader follow the logic of the program.

One good practice is to use meaningful variable names. If a variable represents a number of shoes, call it SHOES or NS. Total dollars could be BUCKS or TD. Unfortunately, Commodore BASIC limits you to two significant characters in a variable name (SEN would be considered the same variable as SET).

It doesn't hurt to include a few REMarks here and there, to explain what you're doing and why. You don't have to put a REM on every line, although some people do that. And you can get carried away: **POKE 53281,2: REM PUT A 2 INTO 53281**, for example. Such a remark doesn't explain anything; it's obvious that POKE is putting a number into memory. Better to say **REM CHANGE BACKGROUND TO RED**, or don't include any comment at all (most 64 programmers know that 53281 is the background register).

You can also insert a blank line (or a line of asterisks) between modules to indicate the breaks between major sections.

Indenting a FOR-NEXT loop is a courtesy to the reader. It's done so people reading through the program can see how far the loop extends. This isn't an inviolable rule. In a short loop containing one or two commands, the beginning and end are obvious. There's no need to indent a tiny loop.

Why do so many Commodore programmers write unstructured, uncommented BASIC programs with multistatement lines? Think back to the early Commodores such as the VIC-20 and the PET. Running out of memory was always a problem, and Commodore programmers developed a highly-crunched memory-saving style because they had to. When VIC and PET owners bought 64s and 128s, their crunched style carried over to the new computers. Unstructured programming became a Commodore tradition.

Structured Creativity

The proponents of unstructured style say, "If the program works, it works. The rules of structure are a fetter on my creativity. Besides, if no one else ever sees the program, it doesn't matter if the listing looks pretty."

Let's consider these arguments. You can't dispute the first one. If a program works, it works. But how do you know it works? Someone who writes programs that look sloppy might create a program that *seems* to run correctly, but actually contains subtle bugs you don't notice right away. Untangling the spaghetti is the only way to know for sure.

What about creativity? There are plenty of creative writers who manage to follow the low-level rules of spelling and grammar and still fit their sentences into paragraph structures, paragraphs into scenes, and scenes into chapters. You can be a wildly creative writer or programmer, but still impose some order and structure on the finished work. If you study large programs, you'll usually see that they've been split into sections (subroutines or modules), each of which handles a certain function. The programmer planned ahead and figured out what had to be done.

To paraphrase Jim Butterfield, even a simple line like **FOR X=1 TO 50: READ A(X)** involves some planning. You've decided that the loop should repeat 50 times. You plan to close up the loop eventually with a NEXT. The READ implies that there will be DATA statements elsewhere in the program. The numeric array will have to be DIMensioned. If you can do that much thinking ahead for a couple of statements, surely you can take a few moments to organize the program's structure.

If others, including teachers or programmers, will see your program, they'll be able to read it more easily if you write in a structured style. Also, it's embarassing to have someone look at a sloppily-written program you wrote. What about programs you write for your own use that no one else will see? The time may come when you need to change something. A spaghetti program you wrote six months before is nearly impossible to follow.

There's nothing sinister or anticreative about structured programming. All you need to do is organize your thoughts a bit before you start a program and then do a few things to organize the way the program looks.

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power BASIC Three Pack

Bob Lafferty

This short utility adds three useful commands to the 64: Place, Erase, and Beep. With one SYS, you can position the cursor, erase a group of screen lines, or produce an attention-getting beep.

Commodore 64 BASIC is not known for its wide variety of commands. In fact, BASIC 2.0 doesn't even include a statement for positioning the cursor. Because of this, machine language routines that add to BASIC have become very popular. Here's a program that combines three such routines into one small package: "Three Pack."

Through the use of the SYS statement, Three Pack gives BASIC programmers the ability to position the cursor, erase one or more screen lines, and emit a beep sound. And as its name implies, Three Pack is compact, convenient, and easy to use.

Typing It In

Three Pack is a BASIC program that POKEs three machine language routines into memory. Type it in and save a copy to tape or disk. To insure accurate entry, use the "Automatic Proofreader" program found elsewhere in this issue. Three Pack must be loaded and run before you can use any of its commands. Alternatively, you can merge it with your own programs.

Using The Commands

To use Three Pack, set up these three variables in the beginning of your program:

```
PL=53121:ER=53146:BP=53192
```

These variables contain the addresses for the three routines PLace, ERase, and BeeP.

The most practical of these routines is probably Place. This routine uses the following syntax: **SYS PL,*y*,*x*** where *y* is the desired vertical position (0–24) and *x* is the horizontal position (0–39) of the cursor. For example, the statement **SYS PL,12,17:PRINT "HELLO"** prints a common greeting in the middle of the screen. If you specify values outside the screen area—say, an *x*-coordinate of 40—the computer responds with ILLEGAL QUANTITY ERROR.

The Erase command comes in handy when you want to erase certain sections of the screen. Its syntax is **SYS ER,*l*,*n***. Here, *l* is the screen line (0–24), and *n* is the number of lines to erase. The command **SYS ER,0,25** erases the entire screen, while **SYS ER,10,2** erases lines 10 and 11 only.

The last command—Beep—is often found in other versions of BASIC. To use this command, simply enter **SYS BP**. As the name implies, this statement emits a beep.

See program listing on page 115.

COMPUTE!'s Gazette is looking for utilities, games, applications, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it, on tape or disk, to:

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Robotitos: The Real Robot Revolution

Fred D'Ignazio
Associate Editor

Many of you who are waiting for the day when C3PO or R2D2 comes walking up to you and says, "Hi, Master! Welcome to the Age of Personal Robotics."

But don't hold your breath waiting—humanoid robots like those found in science-fiction films and Isaac Asimov's novels are so complex that they are unlikely to make the leap from fantasy to fact in our lifetime. We can't build a robot eye or a robot hand which approximates its human counterpart, so how can we expect to integrate all these "subsystems" into an intelligent, independent, mobile machine? The task is so formidable that many robotics experts predict that we may never be able to build an android robot capable of imitating a human being.

But all of you robot fans out there, don't lose heart. Real robots are still coming. Even now they are quietly sneaking up on you.

Captain Cook's Islanders

The problem is that we're looking in all the wrong places. After six decades of imaginative speculation by scientists, artists, and writers, we have become convinced that the first robots will be steel-and-plastic caricatures of creatures—people or other living beings like cats, dogs, spiders, or aliens. We already have plenty of robot toys and pets—dogsters, catsters, Armatron, Robie Jr., Teddy Ruxpin, Transformers, and so on—which are semirobotic. People assume that these robots will eventually grow more sophisticated and evolve into real robots.

Meanwhile, the real robots are literally crawling out of the woodwork, but we are like the islanders Captain Cook met in the Pacific Ocean on his voyage around the world. There was nothing in the islanders' culture that prepared them for a man-made object the size of Cook's ship, so to the islanders the ship was invisible. Real robots are the same to modern man—for the moment they're invisible. We don't see them coming.

Into The Belly Of A Robot

The reason we don't see the robots is because they're *hiding*—inside commonplace objects that are so familiar they are invisible. Take one of the more spectacular robots—the robot train that whooshes airlines passengers around the Atlanta airport. The train has many robotic attributes: It is computer-controlled, independent, and preprogrammed. It has no human operator aboard. It has arrays of sensors which feed back information from the real world. Instead of arms and legs, it has wheels and doors. And, unlike a pure, nonrobotic computer, its actions have an immediate, physical effect on the real world—it moves people and their luggage around the airport.

Oh, and I almost forgot, it *talks* to you.

I've been the train's guest on numerous occasions (after getting swept by a sea of people into its brightly colored "belly" like a modern-day Jonah). And I've yet to hear anyone on board recognize the train for what it really is: a robot.

But that's probably just as well, since it might worry people if they knew they were placing their lives, even temporarily, into the hands of a robot.

The point is that we don't recognize the robot even when we crawl inside it because its robotic parts (computers, sensors, anthropoid features) are all hidden or nonexistent. And what we do see—a train—is such a familiar part of the urban landscape that, beyond face value, we ignore it.

Robot Fragments

If we saw bits of human beings scattered around a room, we might think we were reading a Stephen King novel or witnessing a particularly grisly murder. But bits of robots are surfacing around us all the time, and I've yet to hear anyone take notice.

For example, take the little high-tech key chains that are becoming popular. They come in a variety of forms, looking like golf balls, Rubik's cubes, or simple black key cases. Until you talk to them. Then they beep, whistle, sing, or talk back to you. The theory is that if you put them down and lose them, all you have to do is call, whistle, or clap your hands, and they cry out in tiny voices: "We are here! We are here!"

Properly speaking, these are not robots at all—they are *fragments* of robots—masquerading as commonplace objects, perhaps novel and cute, but otherwise too trivial to be worth noticing. Except that the trickle of these little *robotitos* (to use the Spanish diminuitive) may soon become a flood. Examples are all around us. Our cars have been evolving into robots for years. So have our common appliances—our refrigerators, microwave ovens, sewing machines, telephones, and watches. Manufacturers are already experimenting with intelligent, voice-controlled vacuum cleaners, VCRs, TVs, and compact disc players.

Robots, therefore, *are* appearing—as objects and fragments rather than as fully formed creatures. How they'll evolve next is anybody's guess. But the next time you open a singing greeting card or your watch cries out the time, remember, you are looking at a robotito, something which one day might become a robot as impressive as C3PO or R2D2.

WordCount

Shawn K. Smith

This useful writer's tool counts the words in any text file created by* geoWrite *(any version up to and including 2.0). "WordCount" is both quick and easy to use.

Often we are required to write essays or contest entries that are limited to a certain number of words. Anyone who has taken the time to actually count the number of words in a piece of writing knows how frustrating it can be.

With many word processors, counting words is made easier by the predictable output produced by printers—a consistent number of characters per inch with the same number of lines per page. With *GEOS*'s multiple fonts and variable point sizes, words are more graphically pleasing, but they're harder to count. That's where "WordCount" comes in; it counts the number of words in text files created by *geoWrite*, version 1.2, 1.3, or 2.0.

Getting Started

Enter the BASIC program "WordCount Generator" using "The Automatic Proofreader," found elsewhere in this issue. After you've entered the program, save a copy to a disk using the filename WORDCOUNT GEN. Because this program creates the actual WordCount program file when run, you must not save the program as WORDCOUNT. If you do, the generator program will erase itself when run.

To create the WordCount program file, load WORDCOUNT GEN from disk. Before running WORDCOUNT GEN, insert a *GEOS* work disk (preferably one containing *geoWrite* files). With the work disk in the drive, type RUN and press RETURN. Within a few minutes, WordCount will be written to disk.

Because WordCount is written to run under *GEOS*, it's very easy to use: Simply double-click the WordCount icon from the *GEOS deskTop*. When this is done, a dialog box appears, displaying the names of all *geoWrite* files on the current drive. Using the dialog box, you may Open a file for word counting, read files from another Drive, or Cancel the WordCount program by clicking on the appropriate selector icon.

To count the number of words in a file, highlight the name of the desired *geoWrite* file and click the Open icon. After a brief delay, WordCount displays the number of words contained in the document. According to WordCount, a word is a group of characters that begins with a letter and ends with a space, a RETURN, or a page break. To return to the original WordCount dialog box, click OK.

You may use the Drive selector icon to access files on other disks. If you have a two-drive system, clicking on Drive lists the files found on the other disk drive. In a one-drive system, you are asked to insert a new disk.

To exit the WordCount program, select Cancel.

geoWrite File Structure

Files created by *geoWrite* are stored as Variable Length Indexed Records (VLIR). Briefly explained, each page of a *geoWrite* file is stored as a separate record on disk. Each of these records is grouped together by a link-list file, stored in standard sequential format.

Within the the *geoWrite* text is information concerning font size, font style, tabs, graphics, rulers, and other *geoWrite* specific information. To insure an accurate count, WordCount takes special care to count text only, ignoring any special format code.

See program listing on page 106.

All programs listed in this magazine are available on the GAZETTE Disk. Details elsewhere in this issue.

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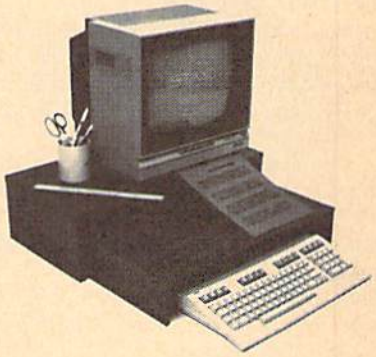

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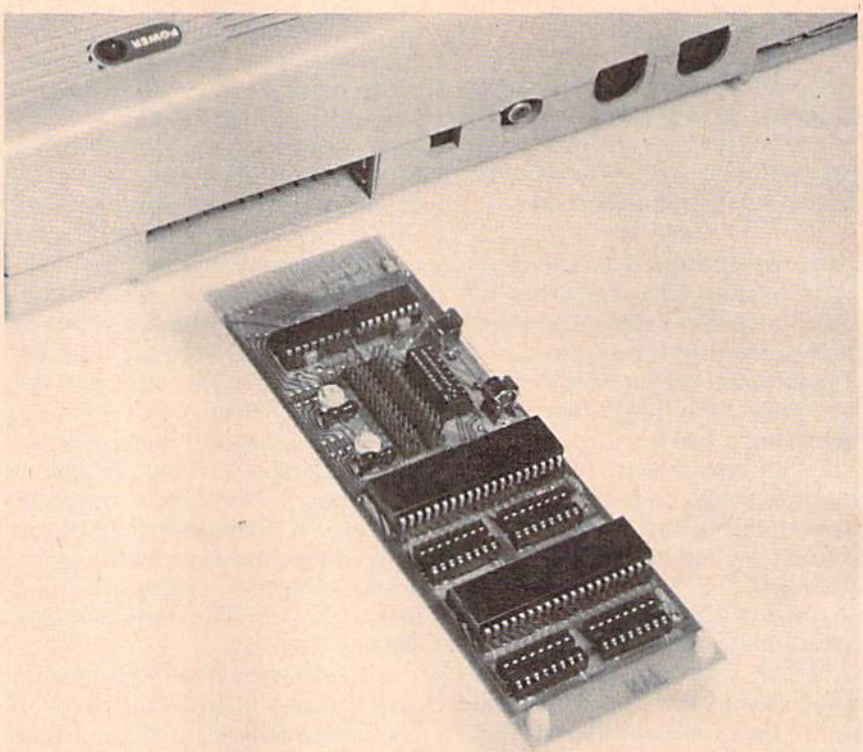
Schnedler Systems has now made available the Duel 6522 VIA (Versatile Interface Adapter) Board (Model No. 64IF22) for the Commodore 64 and 128 that work in all modes, including CP/M. Each board supports two 6522 VIAs properly interfaced to the computer via the cartridge expansion port.

Each board provides four eight-bit ports for a total of 32 I/O lines and eight control or handshake lines. Four boards can be daisy-chained from one computer to give 16 ports. The board also features IRQ capability.

The package includes a program disk and a users' manual. Suggested retail price is $169 for the first board and $149 for each additional board purchased.

Schnedler Systems, P.O. Box 5964, Asheville, NC 28813

Circle Reader Service Number 230.



The Dual 6522 VIA Board plugs directly into the expansion port.

Earn Your Test Pilot Wings

Electronic Arts recently released *Chuck Yeager's Advanced Flight Trainer* for the Commodore 64. The program had previously been available for IBM, Tandy, and compatibles.

General Yeager codesigned the program, which incorporates his flight training and aeronautical expertise. The program uses a super-fast frame rate that lets the user experience mach-speed flight. The simulation features three levels of onscreen instruction from General Yeager.

The first level teaches basic flying skills such as takeoffs and landings. Advanced maneuvers, such as aileron rolls and hammerhead stalls, are taught in the second level. By the third level, the user is shown acrobatic stunts and is ready to use the Formation Flying feature, following Yeager's lead through obstacle courses and over 3-D terrain. A flight recorder allows the user to create and store his or her own stunt flying patterns.

A test pilot option offers a selection of 14 aircraft to evaluate, using actual test-pilot evaluation charts. The aircraft include a Sopwith Camel F-1, the Spad XIII, a P-51 Mustang, and the Bell X-1, which is the same plane with which Yeager broke the sound barrier. A choice of three experimental aircraft is also available.

An airplane-racing option allows the user to choose a plane and fly it through one of six race courses. The computer controls the other competitors.

Suggested retail price for the Commodore 64 version is $34.95.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404

Circle Reader Service Number 231.

Interactive Espionage

Infocom has released its first interactive fiction title in the spy genre. *Border Zone* offers the player three hazardous missions to complete in three different chapters. Each chapter is a complete story in itself, with its own conclusion, but each of the three stories reveals only a part of the entire tale. Each chapter, woven around an assassination plot, puts the player in the role of a different major character. All three characters' lives become intertwined as each carries out his assignment.

In chapter 1, the character is an American businessman, traveling by train from the Eastern Bloc country of Frobnia to neutral Litzenburg. An injured American spy asks if he will deliver a top-secret document over the border. After that, the destiny of that character is uncertain.

With the second chapter, the player assumes the role of Topaz, the American spy. Topaz escaped the KGB by jumping from a speeding train. But he is still in hostile Frobnia, wounded and cold. Topaz must survive and find his way to safety over the border, while guard dogs track him.

In the third chapter, the character is a Soviet agent, who must complete a crucial task before an assassination. But Topaz is following his every move.

In addition to instincts, the player can rely on a Frobnia tourist guide and phrasebook complete with pictures, a National Railway matchbook, a surveyor's map of the border, and a business card from Ostnitz, Litzenburg.

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The game takes place in realtime, an innovation for Infocom. In previous Infocom stories, time progressed at the user's command. In *Border Zone*, time is controlled by a real clock that continues ticking regardless of the player's actions, forcing the player to react quickly.

Border Zone was designed by Marc Blank, designer of *Zork*, *Deadline*, and *Enchanter*.

The Commodore 64 version retails for $34.95.

Infocom, 125 CambridgePark Dr., Cambridge, MA 02140

Circle Reader Service Number 232.

Master Ninja Now Available For 64

Paragon Software has announced that a Commodore 64 version of *Master Ninja: Shadow Warrior Of Death* is now available.

The player assumes the role of a ninja warrior sent on a quest to recover a magic sword stolen by an evil warlord. The player must guide his ninja through more than 25 chambers of the warlord's castle while battling evil ninja warriors, Samurai guards, mystic ninja priests, black magic curses, and deadly tigers. The player uses his ninja's martial-arts skills and historic ninja weapons to kill his opponents, recapture the magic sword, and assassinate the warlord.

Twenty martial-arts skills can be called upon including blocks, kicks, chops, punches, and rolls. Weapons include knives, blinding powder, throwing stars, blow-dart guns, and a bow and arrow.

Suggested retail price is $34.95.

Paragon Software Corporation, 600 Rugh St., Greenburg, PA 15601

Circle Reader Service Number 233.

Bikers, Sweepstakes, And Battles In Space From Brøderbund

Brøderbund Software has recently released *Superbike Challenge* and *Magnetron* for the Commodore 64.

Superbike Challenge allows players to race on 12 of the world's most challenging Grand Prix courses, including Austria's Salzburgring, and Silverstone in Great Britain. Side-by-side screens allow two players to each have a view of the race course as they race against each other. One player can race against bikers controlled by the computer. On-screen indicators show speed, RPM, lap times, race position, and the course layout. Players can choose either keyboard or joystick controls, and select one of three skill levels: Novice, Intermediate, or Pro. A save feature allows games to be saved between races.

Brøderbund is sponsoring a sweepstakes to promote *Superbike Challenge*. Grand Prize is a 650cc Suzuki motorcycle. Two second-prize winners will receive a library of Brøderbund software, while third-prize winners will be rewarded with Hi-Tech Brøderbund sweatshirts. Entry blanks will be enclosed in each *Superbike Challenge* package, or may be obtained through Brøderbund. No purchase is required. The Commodore 64 version of *Superbike Challenge* has a suggested retail price of $19.95.

Magnetron is an arcade-style space-battle game for the Commodore 64. Players pilot a photon fighter and battle Magnetron Generators, which are powerful, unpredictable magnetic-force weapons. Meanwhile, the player must destroy 50 alien war bases surrounding earth. *Magnetron* also includes a Game Generator that allows the user to design his or her own enemy forces.

The game retails for $29.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 234.

Track Satellites And Surveys

Strategic Marketing Resources has released *SATCOMM-64*, a program that tracks communication satellites, along with another program that analyzes survey results.

With a Commodore 64, amateur radio operators can communicate in RTTY, ASCII, and CW modes, in addition to communicating via transponders and BBS-like systems that are on board various amateur radio-communications satellites. *SATCOMM-64* allows users to know when each satellite is accessible and where to aim their antennas.

The program has a master menu with 12 options, and can store information for up to 15 different satellites. It confirms reference orbits and will print out access times for any satellite.

Other features include a changeable satellite menu and a choice of screen plus printed report, or screen alone.

For nonamateur radio operators, the program may be used to track the current group of easily visible satellites.

The program is compatible with a 1541 disk drive and Commodore 1525 or compatible printer. Suggested retail price is $15.95.

Survey Master helps users establish survey parameters and analyze the results. Users can try different sample sizes to determine the effect on the confidence level of the final data. Once the sample size has been selected and the survey conducted, the program accepts the data and generates screen and printed reports.

The program automatically corrects for large and small samples. Its reports recap all of the analysis criteria in addition to providing detailed results. Built-in T-Tables allow proper correction to be applied to the results obtained with relatively small samples.

Survey Master is designed for the Commodore 64 with single or dual 1541 disk drives and a 1525 or compatible printer. The program retails for $29.95.

Strategic Marketing Resources, P.O. Box 2183, Ellisville, MO 63011

Circle Reader Service Number 235.

Four New Releases From Electronic Arts

Electronic Arts recent releases include a battle simulation, a fantasy adventure, a strategy game, and a trivia/strategy game.

Halls of Montezuma is a battle history of the United States Marine Corp, tracing its history from the Mexican War to Vietnam. The battle simulation was designed by Strategic Studies Group.

The player assumes the role of Corporate Commander, who must lead military forces into as many as eight different preprogrammed historic battle scenarios, or scenarios that the user designs.

Two players may battle against one another, or one player may take on the computer. An observe mode is included to use for historical analysis and for testing original scenarios.

The object of the game is to hold back enemy forces and destroy their battalions before they can attack back. The player who scores the most number of points by the end of the game is declared the winner.

The game utilizes the Battlefront Game System which was used with *Battlefront* and *Battles In Normandy*. SSG's *WarGame Construction Set*, *Warplan*, or the icon editor, *Warpaint*, are needed for editing existing scenarios or designing new ones.

Suggested retail price is $39.95.

Another recent release, *Legacy of the Ancients*, transports players to the world of Tarmalon, where they embark on a quest to retrieve the lost Wizard's Compendium, a leather scroll with evil powers.

The search begins at the Museum of the Ancients and leads through towns, forests, castles, and dungeons, where a variety of dangerous creatures reside. Towns offer the player opportunities to purchase armor, obtain magic spells, rob banks, and gamble his hoard away. Each kind of terrain displays unique flora and fauna with whom the player may interact, fight, or make deals.

Players have the ability to manage their character's attributes—such as intelligence, dexterity, and charisma. These can be improved by competing in five action games within the adventure.

The fantasy adventure game was designed by Quest Software. Suggested retail price is $29.95.

A computerized edition of the classic board game *Scrabble* is now available for the Commodore 64 from Electronic Arts. *Computer Scrabble*, designed by Leisure Genius of London, a division of Virgin Games, remains faithful to the original board game. Players build words using letters that have numerical values. The player with the highest letter total wins the game.

The program includes a playing vocabulary of more than 12,000 words. A built-in wordspeller doublechecks every move. Players can choose from four difficulty levels and can either play against the computer, or against two to three other players.

Suggested retail price is $32.95.

Quizam, a space trivia game by Interstel, has also been released by Electronic Arts. The game takes place in space, where as Commander of the U.S. Space Shuttle Flight 310-S, players are instructed to dispose of eight non-functional satellites. Each satellite is equipped with an automatic defense system, which hampers their removal. Onboard computers request information, from approaching space ships, in the form of trivia questions. Players must answer the questions correctly to capture all eight satellites and win the game.

The game supports up to eight players with eight different game boards

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and eight levels of difficulty, with the highest level asking the most difficult questions. Players begin the game on a rotating globe and advance toward each satellite with each correct answer. How fast each answer is given also determines how far the player advances.

Players choose questions from two sources: Fun Facts or School Days. These sources contain categories such as popular culture, television, movies, history, art, geography, and literature. Over 2000 questions are contained on the two-disk program.

Also included is the Quizzer, a question-making program that allows users to create their own categories and questions.

The game is available for the Commodore 64 at a suggested retail price of $29.95.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404

Circle Reader Service Number 236.

Memory Cartridge For 64/128

Scinort Micro has introduced a 32K cartridge that will work with the Commodore 64, and with the 128 in 64 mode. The software can set either BASIC or machine language programs to autoload, autoload and run, manually load, or manually load and run. It can also link or delete programs.

The cartridge uses a 8192-byte 6264LP-15 low standby power static RAM chip and preserves data for over a year with standard AA Carbon-Zinc batteries, which are included. A write-protect switch guards against accidental write access.

With an expansion port expander, users can switch between several cartridges or read from one while a program occupies the entire 64 memory. The cartridge is transparent and does not occupy any of the computer's memory.

Suggested retail price is $59.95.

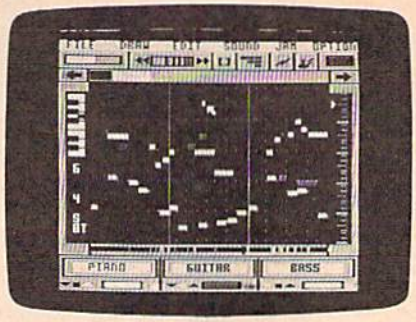
Scinort Micro, P.O. Box 17546, Austin, TX 78760

Circle Reader Service Number 237.

Just Add Notes

Electronic Arts has released *Instant Music*, a computer-aided music composition program for the Commodore 64. The program uses red, green, and blue color bars to show the pitch and duration of notes, instead of regular music notation. Designed for musicians and nonmusicians alike, the program uses artificial intelligence technology to reconstruct the rules of music theory, allowing users to play and compose original music without ever hitting a wrong note.

Users can play the lead instrument in a three-piece band, selecting from



Color bars denote the pitch and duration of notes.

over a dozen instruments included on the disk. New instrument sounds can also be created with the built-in synthesizer feature. The program also supports MIDI-out. MIDI users can also take advantage of the MIDI sync feature, which adds drum-machine sound to the composition.

The program contains a library of over 40 preprogrammed songs in categories including classical, jazz, blues, pop, and reggae, and rock sounds such as Motown, 50s, 60s, new wave, heavy metal, and psychedelic.

Suggested retail price is $29.95.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404

Circle Reader Service Number 238.

Toy Shop Price Reduced

Brøderbund has announced another reduction in the price for the Commodore version of *The Toy Shop*. The program now carries a suggested retail price of $29.95. It previously sold for $39.95.

The Toy Shop is a program for making 20 different working mechanical models. The user can customize the designs before printing them out and mounting them on adhesive cardstock. The parts can then be cut out and assembled. Models range from an antique truck to a carousel and a jet plane.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 239.

Basketball Takes To The Streets

Epyx has released *Street Sports Basketball*, the second in its Street Sports software series. The initial offering was *Street Sports Baseball*. Unlike other sports software programs, the Street Sports line attempts to recreate neighborhood pickup games.

In *Street Sports Basketball*, players start by selecting whether they want to play in a schoolyard, an alley, a suburban backyard, or an inner-city parking lot. Each court has its own particular advantages and disadvantages.

Players can either compete against the computer or against another player. The computer can be set at skill levels of easy, intermediate, or tough. After selecting a name for the team, each player must choose sides. There are ten neighborhood players to choose from, and each is profiled with a description of his or her strengths and weaknesses.

Offensive and defensive movement on the court is joystick controlled. Passing and shooting are also controlled by the joystick.

The game is available for the Commodore 64 for a suggested retail price of $39.95.

Epyx, P.O. Box 8020, Redwood City, CA 94063

Circle Reader Service Number 240.

Fantasy And Flight From Activision

Activision has released a fantasy role-playing game and an arcade-style air race game for the Commodore 64.

Book One: Secret of the Inner Sanctum is the first Commodore release from the Might and Magic series, originally released for the Apple II. Players must guide a party of six adventurers through the three-dimensional Land of Varn. The party must cross oceans, climb mountains, and search through castles and dungeons in order to find the mysterious Inner Sanctum. Any one of 50 areas with 13,000 locations may contain the winning clue, assuring that no two games are alike. A combat system contains hundreds of special events and encounters including over 200 good and bad monsters, 94 magic spells, and over 250 magic items to find.

Suggested retail for the Commodore version is $39.95.

GeeBee Air Rally recreates the era of barnstorming in the form of an air race game. Included are more than 250 levels of difficulty on a progression of 16 different air race courses. Each course features three-dimensional scrolling graphics. The level of difficulty increases as players progress from course to course. Bonus courses include two slaloms and two balloon breakers.

During the race, players must fly over, under, and around the competition. Cutting it too close may force the player to bail out. The pilot may successfully parachute, land, and be rescued by a beautiful farmer's daughter, or he may end up in a pig sty.

After a course has been completed, the pilot will be honored on the awards platform, have his picture taken for the local paper, and receive a kiss from an adoring fan.

The Commodore 64 version sells for a suggested retail price of $29.95.

Activision, P.O. Box 7286, Mountain View, CA 94039

Circle Reader Service Number 241.

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1019:EC 10 60 A9 00 8D ED 10 7C
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10B1:08 10 20 40 80 00 00 00 E5
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10C9:F6 F6 F8 FD 00 05 09 0B 53
10D1:0B 0B 09 05 00 F7 F8 FD 7B
10D9:00 02 06 08 09 08 06 02 32
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1229:57 41 52 20 20 1C 53 43 F0
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1279:9D 11 A7 12 90 20 05 92 68
1281:A5 9D 9D 9D 11 20 A3 20 DD
1289:00 90 20 A4 20 9D 9D 9D 70
1291:11 A7 12 20 92 A5 9D 9D 70
1299:9D 11 20 A3 20 00 00 00 10
12A1:00 00 00 13 11 11 11 20 06
12A9:20 20 20 20 20 20 20 20 CD
12B1:20 20 20 20 20 20 81 47 BF
12B9:41 4D 45 20 4F 56 45 52 2D
12C1:0D 11 20 20 20 20 20 20 98
12C9:20 1E 50 52 45 53 53 20 F2
12D1:5B 52 45 54 55 52 4E 5D 14
12D9:20 54 4F 20 52 45 53 54 B1
12E1:41 52 54 00 00 00 AD EE 10
12E9:10 29 01 D0 03 4C 2E 14 47
12F1:AD ED 10 D0 18 AD EC 10 D8
12F9:C9 30 B0 08 A9 81 8D AB BF
1301:10 4C 1C 13 38 E9 B0 8D 4F
1309:AB 10 4C 1C 13 A9 50 18 4C
1311:6D EC 10 10 02 A9 7F 8D 6F
1319:AB 10 A9 8C 38 ED A0 12 E3
1321:8D AC 10 AD AB 10 10 06 D9
1329:A9 00 38 ED AB 10 8D AD 70
1331:10 AD AC 10 10 06 A9 00 4D
1339:38 ED AC 10 8D AE 10 A9 7E
1341:FF 8D 95 10 4E AD 10 4E 16
1349:AE 10 EE 95 10 AD AD 10 A4
1351:C9 08 B0 F0 AD AE 10 C9 95
1359:07 B0 E9 AD AD 10 D0 0C A2
1361:A0 0F AD AC 10 10 02 A0 81
1369:07 4C C3 13 AD AE 10 D0 E8
1371:0F CE AD 10 A0 0B AD AB C1
1379:10 10 02 A0 04 4C C3 13 E1
1381:A0 0D AD AD 10 CD AE 10 F0
1389:F0 06 A0 0C B0 02 A0 0E 5B
1391:AD AB 10 0D AC 10 10 29 3B
1399:AD AB 10 2D AC 10 10 08 24
13A1:98 38 E9 08 A8 4C C3 13 F0
13A9:8C A3 12 AD AB 10 10 0A E3
13B1:A9 0E 38 ED A3 12 A8 4C 19
13B9:C3 13 A9 16 38 ED A3 12 EF
13C1:A8 B9 63 10 8D A1 12 B9 E8
13C9:73 10 8D A2 12 AD 5F 10 9F
13D1:F0 5A C9 02 D0 09 AD EE 55
13D9:10 29 03 C9 03 D0 4D AD F2
13E1:95 10 A8 AD EE 10 D9 96 C8
13E9:10 B0 03 4C 2E 14 BD 9B 42
13F1:10 38 ED A1 12 8D 83 10 E3
13F9:BD A3 10 38 ED A2 12 8D 19
1401:84 10 AD 83 10 10 06 38 62
1409:A9 00 ED 83 10 C9 21 B0 96
1411:06 AD 83 10 9D 9B 10 AD 42
1419:84 10 10 06 38 A9 00 ED 40
1421:84 10 C9 21 B0 06 AD 84 58
1429:10 9D A3 10 8E F4 10 8A 29
1431:D0 44 AD 5F 10 D0 10 8D EF
1439:F5 10 EE F5 10 D0 FB EE 48
1441:F5 10 D0 FB 4C 78 14 18 C6
1449:A0 13 A2 0B 20 F0 FF AD FD
1451:5F 10 C9 01 F0 10 A9 4A DB
1459:A0 12 AE 1B D4 30 14 A9 17
1461:5F A0 12 4C 75 14 A9 74 2C
1469:A0 12 AE 1B D4 30 04 A9 07
1471:8B A0 12 20 1E AB AE F4 BD
1479:10 60 03 47 45 30 00 00 81
1481:00 00 00 00 00 00 00 00 A9
1489:00 00 00 00 00 00 24 00 F9
1491:00 91 00 01 4A 80 00 10 92
1499:80 02 AA 40 00 44 80 05 F2
14A1:2A 40 00 52 00 02 20 80 DC
14A9:00 89 00 00 34 00 00 00 D5
14B1:00 00 00 00 00 00 00 00 D9
14B9:00 00 00 00 00 00 00 00 E1
14C1:00 00 00 00 01 08 80 00 13
14C9:49 20 0C 10 00 01 94 30 7E
14D1:00 01 00 09 04 60 00 01 6D
14D9:08 00 40 00 32 00 88 02 B2
14E1:00 00 10 42 08 04 00 20 A0
14E9:00 CA 04 12 00 40 00 20 87
14F1:80 02 02 90 00 10 00 01 65
14F9:C0 00 00 00 00 00 02 00 86
1501:40 00 42 08 20 00 00 00 15
1509:00 80 08 88 04 00 00 00 FC
1511:20 11 09 01 00 00 88 00 D1
1519:42 00 00 00 20 00 08 02 77
1521:00 40 00 00 02 20 00 20 0C
1529:01 12 01 40 00 00 08 40 CC
1531:10 00 02 02 20 00 00 01 C5
1539:11 04 00 00 00 00 00 00 EC
1541:20 02 04 80 00 00 02 01 89
1549:10 10 08 00 00 80 00 02 84
1551:00 00 00 20 00 04 00 00 8D
1559:00 00 00 01 10 00 00 80 94
1561:00 04 00 00 00 10 00 00 CC
1569:00 00 02 10 00 00 01 00 D6
1571:00 40 20 02 00 00 10 04 F3
1579:80 00 00 08 40 FF 00 00 66
1581:00 00 00 00 00 00 00 00 AB
1589:00 00 00 00 00 00 00 00 B3
1591:00 00 00 00 00 00 00 00 BB
1599:00 00 00 00 00 18 00 00 24
15A1:18 00 00 00 00 00 00 00 D7
15A9:00 00 00 00 00 00 00 00 D3
15B1:00 00 00 00 00 00 00 00 DB
15B9:00 00 00 00 00 00 00 00 E3
15C1:00 00 00 00 00 00 00 00 EB
15C9:00 00 00 40 00 00 60 00 B8
15D1:00 70 00 00 78 00 00 7C 58
15D9:00 00 7E 00 00 7F 00 00 D1
15E1:7F 80 00 7F C0 00 7F E0 C9
15E9:00 7F 00 00 78 00 00 40 F7
15F1:00 00 00 00 00 00 00 00 1C
15F9:00 00 00 00 00 00 00 00 24
1601:00 00 00 00 00 00 00 00 2D
1609:00 00 00 00 00 03 00 00 41
1611:01 C0 00 01 F0 00 00 FE 84
1619:00 00 FF 80 00 7F F0 00 2D
1621:7F E0 00 3F C0 00 3F 80 3E
1629:00 1F 00 00 1E 00 00 08 16
1631:00 00 00 00 00 00 00 00 5D
1639:00 00 00 00 00 00 00 00 65
1641:00 00 00 00 00 00 00 00 6D
1649:00 00 00 00 00 00 00 00 75
1651:00 00 00 00 00 00 0F FF 9B
1659:E0 03 FF E0 01 FF C0 00 4E
1661:7F C0 00 3F 80 00 0F 80 14
1669:00 07 00 00 03 00 00 00 6F
1671:00 00 00 00 00 00 00 00 9D
1679:00 00 00 00 00 00 00 00 A5
1681:00 00 00 00 00 00 00 00 AD
1689:00 00 00 00 00 00 00 00 B5
1691:00 00 C0 00 07 C0 00 3F 50
1699:C0 01 FF C0 0F FF C0 01 6D
16A1:FF C0 00 3F C0 00 07 C0 C6
16A9:00 00 C0 00 00 00 00 00 ED
16B1:00 00 00 00 00 00 00 00 DD
16B9:00 00 00 00 00 00 00 00 E5
16C1:00 00 00 00 00 00 00 00 ED
16C9:00 00 00 00 00 00 03 00 FB
16D1:00 07 00 00 0F 80 00 3F 79
16D9:80 00 7F C0 01 FF C0 03 CE
16E1:FF E0 0F FF E0 00 00 00 2F
16E9:00 00 00 00 00 00 00 00 16
16F1:00 00 00 00 00 00 00 00 1E
16F9:00 00 00 00 00 00 00 00 26
1701:00 00 00 00 00 00 00 00 2F
1709:00 00 00 08 00 00 1E 00 F3
1711:00 1F 00 00 3F 80 00 3F 42
1719:C0 00 7F E0 00 7F F0 00 85
1721:FF 80 00 FE 00 01 F0 00 45
1729:01 C0 00 03 00 00 00 00 38
1731:00 00 00 00 00 00 00 00 5F
1739:00 00 00 00 00 00 00 00 67
1741:00 00 00 00 00 00 00 00 6F
1749:00 00 00 40 00 00 78 00 6C
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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Delta War

See instructions in article on page 46 before typing in.

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0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 78 AD 18 03 5F
0811:8D E6 12 AD 19 03 8D E7 96
0819:12 A9 A8 8D 18 03 A9 08 B2
0821:8D 19 03 58 20 81 FF A9 D4
0829:00 8D 20 D0 8D 21 D0 A9 E9
0831:80 85 5F A9 14 85 60 A9 8A
0839:C0 85 5A A9 19 85 5B A9 30
0841:40 85 58 A9 25 85 59 20 8A
0849:BF A3 A9 00 8D 15 D0 A2 5C
0851:18 9D 00 D4 CA 10 FA A9 58
0859:93 20 D2 FF A9 1B 8D 0C 76
0861:D4 A9 03 8D 08 D4 A9 22 88
0869:8D 05 D4 A9 3C 8D 01 D4 A5
0871:A9 FF 8D 0E D4 8D 0F D4 B8
0879:A9 8A 8D 18 D4 A9 81 8D 12
0881:12 D4 A2 02 A9 84 9D F8 D7
0889:07 E8 E0 08 90 F8 A9 02 B1
0891:8D 29 D0 8D 2B D0 8D 2D 8A
0899:D0 A9 06 8D 2A D0 8D 2C F1
08A1:D0 8D 2E D0 4C C5 08 20 F9
08A9:EA FF 20 E1 FF D0 12 78 31
08B1:AD E6 12 8D 18 03 AD E7 7D
08B9:12 8D 19 03 58 20 81 FF CF
08C1:60 4C 4B 08 AD 61 10 D0 E2
08C9:05 A9 01 8D 61 10 A9 F7 56
08D1:A0 10 20 1E AB A2 05 A9 B7
08D9:11 9D 77 02 CA 10 FA A9 1F
08E1:05 85 C6 20 01 09 AD 61 99
08E9:10 8D 20 12 A9 00 8D 21 14
08F1:12 8D E7 10 8D E8 10 20 BC
08F9:78 0A 4C EE 0A 4C 00 0A CC
0901:A2 06 20 61 0A AD 5E 10 D3
0909:D0 0A A9 61 A0 11 20 1E F8
0911:AB 4C 1C 09 A9 77 A0 11 9D
0919:20 1E AB 20 3E 0A C9 11 F8
0921:F0 12 C9 91 F0 D7 EE 5E A5
0929:10 AD 5E 10 29 01 8D 5E 42
0931:10 4C 01 09 A2 08 20 61 E5
0939:0A AD 5F 10 D0 0A A9 8D 38
0941:A0 11 20 1E AB 4C 5E 09 22
0949:C9 02 F0 0A A9 9D A0 11 95
0951:20 1E AB 4C 5E 09 A9 AD 4D
0959:A0 11 20 1E AB 20 3E 0A 4A
0961:C9 11 F0 16 C9 91 F0 98 2B
0969:EE 5F 10 AD 5F 10 C9 03 79
0971:90 05 A9 00 8D 5F 10 4C 98
0979:35 09 A2 0A 20 61 0A AD A5
0981:60 10 D0 0A A9 BD A0 11 19
0989:20 1E AB 4C A4 09 C9 02 4C
0991:F0 0A A9 D3 A0 11 20 1E B8
0999:AB 4C A4 09 A9 E9 A0 11 01
09A1:20 1E AB 20 3E 0A C9 11 81
09A9:F0 16 C9 91 F0 86 EE 60 EB
09B1:10 AD 60 10 C9 03 90 05 C4
09B9:A9 00 8D 60 10 4C 7B 09 0A
09C1:A2 0C 20 61 0A AD 61 10 1C
09C9:18 69 30 20 D2 FF A9 FF 34
09D1:A0 11 20 1E AB A9 53 AE B7
09D9:61 10 CA D0 02 A9 20 20 1E
09E1:D2 FF 20 3E 0A C9 11 F0 CF
09E9:16 C9 91 F0 8D EE 61 10 B5
09F1:AD 61 10 C9 0A 90 05 A9 18
09F9:01 8D 61 10 4C C1 09 A2 3B
0A01:0E 20 61 0A A9 07 A0 12 AD
0A09:20 1E AB AD 62 10 D0 0A 04
0A11:A9 14 A0 12 20 1E AB 4C 51
0A19:22 0A A9 18 A0 12 20 1E 23
0A21:AB 20 3E 0A C9 91 F0 98 8A
0A29:C9 11 D0 03 4C 01 09 EE 18
0A31:62 10 AD 62 10 29 01 8D 0B
0A39:62 10 4C 00 0A 20 E4 FF A6
0A41:C9 00 F0 F9 C9 0D F0 10 6C
0A49:C9 11 F0 0B C9 91 F0 07 D2
0A51:C9 1D F0 03 4C 3E 0A 60 AF
0A59:68 68 A9 93 20 D2 FF 60 D6
0A61:A9 08 85 D3 A9 20 20 D2 1B
0A69:FF A0 08 18 20 F0 FF A9 96
0A71:3E 20 D2 FF E6 D3 60 A9 F7
0A79:00 8D 15 D0 A9 02 8D 27 38
0A81:D0 A9 06 8D 28 D0 A9 01 DA
0A89:8D 10 D0 A9 38 8D 00 D0 E5
0A91:A9 28 8D 02 D0 AD 1B D4 9E
0A99:29 1F 18 69 4A 8D 01 D0 FE
0AA1:AD 1B D4 29 1F 18 69 98 45
0AA9:8D 03 D0 A9 88 8D F8 07 6D
0AB1:A9 90 8D F9 07 AD 1E D0 0C
0AB9:0D 1F D0 D0 F8 A9 03 8D 45
0AC1:15 D0 A2 00 A9 00 9D 9B 0D
0AC9:10 9D A3 10 9D B7 10 9D 4C
0AD1:BF 10 9D 85 10 9D 8D 10 F7
0AD9:E8 E0 08 D0 E9 8D EE 10 1C
0AE1:A9 93 20 D2 FF 20 7F 0B 6B
0AE9:A9 00 85 A2 60 A2 00 E0 1C
0AF1:02 B0 24 AD EE 10 29 01 9D
0AF9:D0 03 20 E3 0C 20 13 0D 8D
0B01:20 AD 0E AD EE 10 29 01 3A
0B09:F0 16 BD 00 DC 29 10 D0 51
0B11:0F 20 FB 0B 4C 21 0B 20 04
0B19:4C 0B 20 AD 0E 20 AD 0E 51
0B21:E8 E0 08 D0 CA 20 D7 0D 85
0B29:20 AC 0B EE EE 10 AD EE CC
0B31:10 29 07 8D EE 10 AD F1 58
0B39:10 D0 B2 A9 A5 A0 12 20 70
0B41:1E AB A5 C5 C9 01 D0 FA 51
0B49:4C 4B 08 BD 8D 10 F0 2D F0
0B51:FE 85 10 D0 28 FE 8D 10 BF
0B59:BD 8D 10 CD 60 10 90 1D 12
0B61:A9 00 9D 9B 10 9D A3 10 08
0B69:9D 8D 10 9D B7 10 9D BF 86
0B71:10 A9 FF 38 FD AF 10 2D 79
0B79:15 D0 8D 15 D0 60 A9 22 CE
0B81:A0 12 20 1E AB AE E7 10 4A
0B89:A9 00 20 CD BD A9 14 85 97
0B91:D3 A9 38 A0 12 20 1E AB 06
0B99:AE E8 10 A9 00 20 CD BD B7
0BA1:A9 1E 85 D3 A9 42 A0 12 AB
0BA9:20 1E AB A9 13 20 D2 FF 26
0BB1:A9 01 8D 86 02 A9 24 85 7B
0BB9:D3 A5 A2 C9 3C 90 11 A9 04
0BC1:00 85 A2 CE 21 12 10 08 F3
0BC9:A9 3B 8D 21 12 CE 20 12 65
0BD1:AD 20 12 18 6D 21 12 8D 2C
0BD9:F1 10 AD 20 12 18 69 30 98
0BE1:20 D2 FF A9 3A 20 D2 FF 4F
0BE9:AE 21 12 E0 0A B0 05 A9 B6
0BF1:30 20 D2 FF A9 00 20 CD DD
0BF9:BD 60 8E F2 10 E8 E8 E0 DE
0C01:08 90 03 4C DF 0C BD 8D 9E
0C09:10 D0 F2 A9 20 8D 04 D4 6A
0C11:A9 21 8D 04 D4 8E F3 10 11
0C19:A9 00 85 FB A9 D0 85 FC 0F
0C21:8A 18 6D F3 10 65 FB 85 05
0C29:FB A0 00 AD EC 10 91 FB 09
0C31:C8 AD A0 12 91 FB AE F3 1C
0C39:10 AD ED 10 D0 0F A9 FF 99
0C41:38 FD AF 10 2D 10 D0 8D C4
0C49:10 D0 4C 57 0C BD AF 10 63
0C51:0D 10 D0 8D 10 D0 AE F2 FA
0C59:10 BD F8 07 38 E9 85 A8 95
0C61:AE F3 10 B9 63 10 18 79 70
0C69:63 10 18 79 63 10 9D 9B 04
0C71:10 B9 73 10 18 79 73 10 0D
0C79:18 79 73 10 9D A3 10 98 9F
0C81:AA A0 01 BD D7 10 18 71 B3
0C89:FB 91 FB A0 00 BD C7 10 24
0C91:30 16 18 71 FB 91 FB 90 10
0C99:31 AE F3 10 BD AF 10 0D 4F
0CA1:10 D0 8D 10 D0 4C CB 0C 04
0CA9:38 A9 00 FD C7 10 8D A3 65
0CB1:12 38 B1 FB ED A3 12 91 8A
0CB9:FB B0 0F AE F3 10 A9 FF FB
0CC1:38 FD AF 10 2D 10 D0 8D 45
0CC9:10 D0 AE F3 10 BD AF 10 1A
0CD1:0D 15 D0 8D 15 D0 20 AD 82
0CD9:0E A9 01 9D 8D 10 AE F2 5A
0CE1:10 60 BD 00 DC 8D E9 10 D2
0CE9:A0 01 A9 04 2D E9 10 F0 2A
0CF1:0B A0 FF A9 08 2D E9 10 2B
0CF9:F0 02 A0 00 8C EA 10 BD 0D
0D01:F8 07 38 E9 85 18 6D EA 51
0D09:10 29 0F 18 69 85 9D F8 6E
0D11:07 60 BD 00 DC 29 01 D0 DC
0D19:45 BD F8 07 38 E9 85 A8 F1
0D21:BD 9B 10 18 79 63 10 8D 8B
0D29:83 10 BD A3 10 18 79 73 42
0D31:10 8D 84 10 AD 83 10 10 F3
0D39:06 38 A9 00 ED 83 10 C9 01
0D41:20 B0 06 AD 83 10 9D 9B 66
0D49:10 AD 84 10 10 06 38 A9 1B
0D51:00 ED 84 10 C9 20 B0 06 AE
0D59:AD 84 10 9D A3 10 AD 62 62
0D61:10 D0 72 BD 00 DC 29 02 A9
0D69:D0 6B AD EE 10 D0 66 A9 A5
0D71:FF 38 FD AF 10 2D 15 D0 84
0D79:8D 15 D0 A0 00 AD 1B D4 85
0D81:8D EC 10 AD 1B D4 29 1F 18
0D89:18 69 1C 6D EC 10 8D EC 14
0D91:10 90 0C BD AF 10 0D 10 1D
0D99:D0 8D 10 D0 4C AC 0D A9 67
0DA1:FF 38 FD AF 10 2D 10 D0 AA
0DA9:8D 10 D0 AD 1B D4 C9 A3 E6
0DB1:90 03 38 E9 5C 18 69 3A CA
0DB9:8D A0 12 8A 18 0A A8 AD 95
0DC1:EC 10 99 00 D0 C8 AD A0 2F
0DC9:12 99 00 D0 BD AF 10 0D 3A
0DD1:15 D0 8D 15 D0 60 AD 1E 2F
0DD9:D0 0D 1F D0 8D A3 12 A2 52
0DE1:02 BD AF 10 2D A3 12 F0 70
0DE9:0D A9 FE 9D 8D 10 A9 FF AE
0DF1:9D 85 10 20 4C 0B E8 E0 81
0DF9:08 D0 E6 AD A3 12 29 03 BE
0E01:D0 01 60 A2 00 8E F5 10 32
0E09:8E F6 10 A9 80 8D 0B D4 EB
0E11:A9 81 8D 0B D4 BD AF 10 D1
0E19:2D A3 12 F0 0A A9 80 9D 9B
0E21:F8 07 A9 00 9D 27 D0 E8 C4
0E29:E0 02 D0 E9 EE F5 10 D0 2F
0E31:FB EE F6 10 AD F6 10 C9 1A
0E39:08 D0 F1 A9 00 8D F6 10 9A
0E41:A9 01 2D A3 12 F0 03 EE 9B
0E49:27 D0 A9 02 2D A3 12 F0 8F
0E51:03 EE 28 D0 AD 27 D0 29 91
0E59:0F F0 07 AD 28 D0 29 0F DA
0E61:D0 CA A9 01 2D A3 12 F0 EA
0E69:03 EE F8 07 A9 02 2D A3 A5
0E71:12 F0 03 EE F9 07 A9 01 62
0E79:2D A3 12 F0 0A AD F8 07 66
0E81:C9 83 B0 0D 4C 2D 0E AD 2B
0E89:F9 07 C9 83 B0 03 4C 2D 2D
0E91:0E EE F5 10 D0 FB A2 00 EB
0E99:BD AF 10 2D A3 12 D0 03 5F
0EA1:FE E7 10 E8 E0 02 D0 F0 69
0EA9:20 78 0A 60 A9 00 85 FB 8F
0EB1:A9 D0 85 FC 8E EB 10 8A 26
0EB9:18 6D EB 10 65 FB 85 FB DD
0EC1:A0 00 B1 FB 8D EC 10 AE 13
0EC9:EB 10 BD AF 10 2D 10 D0 B8
0ED1:8D ED 10 A0 01 B1 FB 8D 90
0ED9:A0 12 20 E8 12 AD ED 10 90
0EE1:D0 11 AD 1C 12 CD EC 10 D3
0EE9:90 17 EE EC 10 20 ED 0F AC
0EF1:4C 02 0F AD 1D 12 CD EC 2B
0EF9:10 B0 06 CE EC 10 4C EE 27
0F01:0E AD A0 12 CD 1E 12 B0 82
0F09:09 EE A0 12 20 2C 10 4C BA
0F11:1E 0F CD 1F 12 90 06 CE 5B
0F19:A0 12 4C 0D 0F A9 00 8D 13
0F21:A1 12 8D A2 12 BD 9B 10 3F
0F29:18 7D B7 10 9D B7 10 BD 54
0F31:B7 10 30 10 C9 10 90 1C 02
0F39:38 E9 10 9D B7 10 EE A1 47
0F41:12 4C 30 0F C9 F1 B0 0C F5
0F49:18 69 10 9D B7 10 CE A1 E6
0F51:12 4C 30 0F BD A3 10 18 37
0F59:7D BF 10 9D BF 10 BD BF 7B
0F61:10 30 10 C9 10 90 1C 38 65
0F69:E9 10 9D BF 10 CE A2 12 43
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1751:00 7F 00 00 7F E0 00 7F 5E
1759:C0 00 7F 80 00 7F 00 00 DD
1761:7E 00 00 7C 00 00 78 00 87
1769:00 70 00 00 60 00 00 40 F6
1771:00 00 00 00 00 00 00 00 9F
1779:00 00 00 00 00 00 00 00 A7
1781:00 00 00 00 00 00 00 00 AF
1789:00 00 00 00 00 00 00 00 B7
1791:01 FF C0 01 FF C0 00 FF 6B
1799:80 00 FF 80 00 7F 00 00 0E
17A1:7F 00 00 3E 00 00 3E 00 EF
17A9:00 1C 00 00 1C 00 00 08 C7
17B1:00 00 08 00 00 00 00 00 E0
17B9:00 00 00 00 00 00 00 00 E7
17C1:00 00 00 00 00 00 00 00 EF
17C9:00 00 00 01 00 00 0F 00 26
17D1:00 7F 00 03 FF 00 01 FF 12
17D9:00 00 FF 00 00 7F 00 00 06
17E1:3F 00 00 1F 00 00 0F 00 BF
17E9:00 07 00 00 03 00 00 01 F2
17F1:00 00 00 00 00 00 00 00 20
17F9:00 00 00 00 00 00 00 00 28
1801:00 00 00 00 00 00 00 00 31
1809:00 00 00 08 00 00 3C 00 32
1811:00 7C 00 00 FE 00 01 FE 59
1819:00 03 FF 00 07 FF 00 00 42
1821:FF 80 00 3F 80 00 07 C0 38
1829:00 01 C0 00 00 60 00 00 33
1831:00 00 00 00 00 00 00 00 61
1839:00 00 00 00 00 00 00 00 69
1841:00 00 00 00 00 00 00 00 71
1849:00 00 00 00 00 00 60 00 3A
1851:00 70 00 00 F8 00 00 FE 64
1859:00 01 FF 00 01 FF C0 03 56
1861:FF E0 03 FF F8 00 00 00 F1
1869:00 00 00 00 00 00 00 00 99
1871:00 00 00 00 00 00 00 00 A1
1879:00 00 00 00 00 00 00 00 A9
1881:00 00 00 00 00 00 00 00 B1
1889:00 00 00 00 00 00 00 00 B9
1891:01 80 00 01 F0 00 01 FE FA
1899:00 01 FF C0 01 FF F8 01 11
18A1:FF C0 01 FE 00 01 F0 00 F7
18A9:01 80 00 00 00 00 00 00 7A
18B1:00 00 00 00 00 00 00 00 E1
18B9:00 00 00 00 00 00 00 00 E9
18C1:00 00 00 00 00 00 00 00 F1
18C9:00 00 00 00 00 00 00 00 F9
18D1:00 00 00 00 00 00 03 FF 08
18D9:F8 03 FF E0 01 FF C0 01 DF
18E1:FF 00 00 FE 00 00 F8 00 F3
18E9:00 70 00 00 60 00 00 00 39
18F1:00 00 00 00 00 00 00 00 22
18F9:00 00 00 00 00 00 00 00 2A
1901:00 00 00 00 00 00 00 00 33
1909:00 00 00 00 00 00 00 60 9B
1911:00 01 C0 00 07 C0 00 3F 16
1919:80 00 FF 80 07 FF 00 03 CE
1921:FF 00 01 FE 00 00 FE 00 61
1929:00 7C 00 00 3C 00 00 08 64
1931:00 00 00 00 00 00 00 00 63
1939:00 00 00 00 00 00 00 00 6B
1941:00 00 00 00 00 00 00 00 73
1949:00 00 00 01 00 00 03 00 91
1951:00 07 00 00 0F 00 00 1F DC
1959:00 00 3F 00 00 7F 00 00 71
1961:FF 00 01 FF 00 03 FF 00 BF
1969:00 7F 00 00 0F 00 00 01 F4
1971:00 00 00 00 00 00 00 00 A3
1979:00 00 00 00 00 00 00 00 AB
1981:00 00 00 00 00 00 00 00 B3
1989:08 00 00 08 00 00 1C 00 78
1991:00 1C 00 00 3E 00 00 3E FA
1999:00 00 7F 00 00 7F 00 00 B9
19A1:FF 80 00 FF 80 01 FF C0 BC
19A9:01 FF C0 00 00 00 00 00 74
19B1:00 00 00 00 00 00 00 00 E3
19B9:00 00 00 00 00 00 00 00 EB
```

Sound Manager

See instructions in article on page 62 before typing in.

```
C000:4C 06 C0 4C 5F C4 A9 FF 67
C008:85 02 A9 00 8D 08 C5 4C 66
C010:3E C0 02 C8 A9 C8 CD 13 CC
C018:C0 D0 19 A9 02 CD 12 C0 18
C020:D0 12 A9 4C 8D 0F C0 A9 5C
C028:3E 8D 10 C0 A9 C0 8D 11 B6
C030:C0 4C 3E C0 EE 12 C0 D0 0B
C038:D6 EE 13 C0 D0 D1 A9 00 70
C040:8D 07 C5 A9 01 8D 20 D0 EC
C048:A9 06 8D 21 D0 A9 7E A0 AE
C050:C5 20 1E AB A9 AA A0 C5 3A
C058:20 1E AB A9 80 8D 8A 02 D2
C060:20 86 C4 20 7A C4 20 6B C0
C068:C4 AE FD C4 BD 09 C5 85 27
C070:FB BD 1E C5 85 FC A0 0D ED
C078:B1 FB 09 80 91 FB 88 C0 49
C080:02 B0 F5 20 82 C1 20 9E E9
C088:C4 AD AD C6 CD 04 C5 D0 D4
C090:F8 A9 00 85 C6 20 E4 FF D1
C098:F0 FB C9 87 D0 11 AE FD 69
C0A0:C4 BD AD C6 DD 98 C6 F0 E5
C0A8:EC FE AD C6 4C 83 C0 C9 3E
C0B0:88 D0 0E AE FD C4 BD AD 83
C0B8:C6 F0 DA DE AD C6 4C 83 C7
C0C0:C0 C9 86 D0 28 EE FD C4 B0
C0C8:A0 0D B1 FB 29 7F 91 FB 3A
C0D0:88 C0 02 B0 F5 AD FD C4 39
C0D8:10 08 A9 14 8D FD C4 4C 15
C0E0:69 C0 C9 15 D0 83 A9 00 B9
C0E8:8D FD C4 F0 F2 C9 85 D0 F2
C0F0:06 CE FD C4 4C C8 C0 C9 06
C0F8:D1 D0 08 A9 80 8D 07 C5 41
C100:4C 44 E5 C9 D3 F0 03 4C C8
C108:95 C0 20 44 E5 A9 7E A0 42
C110:C5 20 1E AB A9 4C A0 C5 82
C118:20 1E AB 20 E4 FF F0 FB AF
C120:C9 0D D0 03 4C 3E C0 C9 BC
C128:44 F0 08 C9 54 D0 EC A2 0A
C130:01 D0 02 A2 08 A0 01 20 B7
C138:BA FF A9 61 A0 C5 20 1E DE
C140:AB A0 00 20 CF FF 99 6D E2
C148:C5 C8 C0 10 F0 04 C9 0D 32
C150:D0 F1 88 AD 6D C5 C9 0D C7
C158:F0 04 C9 20 D0 03 4C 3E F9
C160:C0 98 A2 6D A0 C5 20 BD AF
C168:FF A9 0D 20 D2 FF A2 02 D7
C170:A0 C8 A9 00 85 FD A9 C0 E3
C178:85 FE A9 FD 20 D8 FF 4C 44
C180:3E C0 AD 37 C5 29 0F AE 1C
C188:B0 C6 F0 0A CA F0 0B CA CF
C190:F0 0C 09 80 D0 0A 09 10 89
C198:D0 06 09 20 D0 02 09 40 0A
C1A0:8D 37 C5 AD B1 C6 8D 35 45
C1A8:C5 A9 00 8D 36 C5 A2 03 63
C1B0:0E 35 C5 2E 36 C5 CA 10 92
C1B8:F7 AD B2 C6 0A 0A 0A 0A FC
C1C0:0D B3 C6 8D 38 C5 AD B4 52
C1C8:C6 0A 0A 0A 0A 0D B5 C6 CA
C1D0:8D 39 C5 AD 37 C5 29 FD 1E
C1D8:AE B8 C6 F0 02 09 02 29 2B
C1E0:FB AE B9 C6 F0 02 09 04 57
C1E8:8D 37 C5 AE BB C6 F0 2C AB
C1F0:AD BA C6 8D 49 C5 AD BC 25
C1F8:C6 0A 0A 0A 0A 09 01 8D 48
C200:4A C5 AD 4B C5 29 8F CA 43
C208:F0 0A CA F0 0B CA F0 17 6D
C210:09 50 D0 15 09 10 D0 11 D4
C218:09 20 D0 0D AD 4A C5 29 60
C220:FE 8D 4A C5 4C 34 C2 09 EF
C228:40 8D 4B C5 AD 4A C5 09 22
C230:01 8D 4A C5 AD 45 C5 29 76
C238:0F AE BF C6 F0 0A CA F0 8B
C240:0B CA F0 0C 09 80 D0 0A D2
C248:09 10 D0 06 09 20 D0 02 3D
C250:09 40 8D 45 C5 AD C0 C6 9D
C258:8D 43 C5 A9 00 8D 44 C5 4D
C260:A2 03 0E 43 C5 2E 44 C5 23
C268:CA 10 F7 60 AD 07 C5 F0 62
C270:26 A5 02 C9 FF B0 20 C9 1C
C278:10 90 08 A9 00 8D 18 D4 01
C280:4C 31 EA 8D AD C6 A9 FF 8A
C288:85 02 A9 00 8D 08 C5 AD 4C
C290:AD C6 CD 04 C5 F0 4D AD D2
C298:AD C6 CD 04 C5 F0 73 AD 27
C2A0:04 C5 8D 05 C5 20 CE C4 AC
C2A8:A2 13 BD AE C6 9D C2 C6 DF
C2B0:CA 10 F7 AD AD C6 8D 05 22
C2B8:C5 20 CE C4 AD AE C2 8D 8A
C2C0:CB C2 AD AF C2 8D CC C2 36
C2C8:A2 13 BD C2 C6 9D AE C6 19
C2D0:CA 10 F7 AD AD C6 8D 04 41
C2D8:C5 AD 07 C5 D0 03 20 86 43
C2E0:C4 20 82 C1 A2 06 A9 00 BD
C2E8:9D 00 D4 CA 10 FA A9 00 44
C2F0:8D 33 C5 8D 41 C5 AD AE C6
C2F8:C6 8D 34 C5 AD BD C6 8D A7
C300:42 C5 AD 37 C5 09 01 8D 25
C308:37 C5 A9 FE 8D FF C4 8D 45
C310:FE C4 AD AF C6 F0 39 8D F2
C318:02 C5 A5 00 8D 03 C5 4E 19
C320:02 C5 6E 03 C5 4E 02 C5 49
C328:6E 03 C5 4E 02 C5 6E 03 4C
C330:C5 AD 03 C5 29 20 D0 26 54
C338:AD 03 C5 18 6D 33 C5 8D E2
C340:33 C5 AD 02 C5 6D 34 C5 BA
C348:B0 06 8D 34 C5 4C 73 C3 A8
C350:A9 00 8D 33 C5 AD AE C6 9A
C358:8D 34 C5 4C 73 C3 AD 33 6A
C360:C5 38 ED 03 C5 8D 33 C5 57
C368:AD 34 C5 ED 02 C5 90 E0 94
C370:8D 34 C5 AD 07 C5 10 05 D3
C378:AD 08 C5 30 55 AD 37 C5 2A
C380:29 01 F0 2D EE FF C4 AD 7C
C388:B6 C6 CD FF C4 B0 43 AD F3
C390:37 C5 29 FE 8D 37 C5 A9 B8
C398:00 8D FF C4 AD 07 C5 10 F4
C3A0:31 AD B7 C6 10 2C AD 08 24
C3A8:C5 18 69 40 8D 08 C5 30 92
C3B0:21 EE FE C4 AD B7 C6 CD 58
C3B8:FE C4 B0 16 AD 37 C5 09 47
C3C0:01 8D 37 C5 A9 00 8D FE D6
C3C8:C4 8D 33 C5 AD AE C6 8D 1C
C3D0:34 C5 AD BE C6 F0 39 8D 7F
C3D8:02 C5 A9 00 8D 03 C5 4E 5A
C3E0:02 C5 6E 03 C5 4E 02 C5 0A
C3E8:6E 03 C5 4E 02 C5 6E 03 0D
C3F0:C5 AD 03 C5 29 20 D0 26 15
C3F8:AD 03 C5 18 6D 41 C5 8D DB
C400:41 C5 AD 02 C5 6D 42 C5 9F
C408:B0 06 8D 42 C5 4C 33 C4 CB
C410:A9 00 8D 41 C5 AD BD C6 5B
C418:8D 42 C5 4C 33 C4 AD 41 BF
C420:C5 38 ED 03 C5 8D 41 C5 35
C428:AD 42 C5 ED 02 C5 90 E0 D9
C430:8D 42 C5 AD 34 C5 48 AE 9C
C438:C1 C6 F0 19 AD 1B D4 4A D1
C440:4A 4A 4A E8 E0 05 D0 FA 11
C448:8D 06 C5 AD 34 C5 18 6D 04
C450:06 C5 8D 34 C5 20 7A C4 AB
C458:68 8D 34 C5 4C 31 EA A9 03
C460:FF 85 02 A9 80 8D 07 C5 34
C468:8D 8A 02 78 A9 6C 8D 14 51
C470:03 A9 C2 8D 15 03 58 4C C8
C478:82 C1 A2 18 BD 33 C5 9D 6D
C480:00 D4 CA 10 F7 60 A9 00 2E
C488:8D FD C4 20 9E C4 EE FD D6
C490:C4 AD FD C4 C9 15 D0 F3 2C
C498:A9 00 8D FD C4 60 AD B6 42
C4A0:C6 D0 03 EE B6 C6 AD B7 F4
C4A8:C6 D0 03 EE B7 C6 AD FD 4B
C4B0:C4 18 69 02 AA A0 0F 18 FD
C4B8:20 F0 FF A9 F2 A0 C4 20 EC
C4C0:1E AB AE FD C4 BD AD C6 39
C4C8:AA A9 00 4C CD BD A9 C2 52
C4D0:8D AE C2 A9 C6 8D AF C2 4E
C4D8:AD 05 C5 F0 14 85 03 AD AC
C4E0:AE C2 18 69 14 8D AE C2 03
C4E8:90 03 EE AF C2 C6 03 D0 5C
C4F0:EE 60 20 20 20 20 20 9D 6F
C4F8:9D 9D 9D 9D 00 00 02 00 4A
C500:00 00 0A 00 00 00 00 00 CC
C508:00 50 78 A0 C8 F0 18 40 3B
C510:68 90 B8 E0 08 30 58 80 4B
C518:A8 D0 F8 20 48 70 04 04 5D
```

```
C520:04 04 04 05 05 05 05 05 CA
C528:05 06 06 06 06 06 06 06 33
C530:07 07 07 87 4E 00 00 14 E0
C538:00 FB 00 00 00 00 00 00 C2
C540:00 00 D6 00 00 11 99 99 B7
C548:00 0A F0 9F 44 49 53 4B A7
C550:20 4F 52 20 54 41 50 45 99
C558:20 5B 44 2F 54 5D 3F 20 FC
C560:00 0D 46 49 4C 45 4E 41 E1
C568:4D 45 3F 20 00 31 0D 4D 02
C570:4F 20 43 4F 44 45 0D 42 9C
C578:4B 55 50 0D 00 00 05 93 77
C580:12 1D 1D 20 53 4F 55 4E D2
C588:44 20 4D 41 4E 41 47 45 47
C590:52 20 92 20 20 20 20 20 83
C598:20 20 20 20 20 20 20 20 24
C5A0:20 20 20 20 20 20 20 20 2C
C5A8:0D 00 11 1D 1D 53 4F 55 D8
C5B0:4E 44 20 23 0D 1D 1D 46 08
C5B8:52 45 51 0D 1D 1D 52 49 05
C5C0:53 45 2F 46 41 4C 4C 0D 72
C5C8:1D 1D 57 41 56 45 46 4F CC
C5D0:52 4D 0D 1D 1D 50 55 4C 6D
C5D8:53 45 20 57 49 44 54 48 25
C5E0:0D 1D 1D 41 54 54 41 43 AB
C5E8:4B 0D 1D 1D 44 45 43 41 D1
C5F0:59 0D 1D 1D 53 55 53 54 CC
C5F8:41 49 4E 0D 1D 1D 52 45 59
C600:4C 45 41 53 45 0D 1D 1D 18
C608:41 2F 44 2F 53 20 54 49 8A
C610:4D 45 0D 1D 1D 52 45 4C 12
C618:45 41 53 45 20 54 49 4D 89
C620:45 0D 1D 1D 53 59 4E 43 E8
C628:48 52 4F 0D 1D 1D 52 49 74
C630:4E 47 20 4D 4F 44 0D 1D 52
C638:1D 46 49 4C 54 45 52 20 50
C640:46 52 45 51 0D 1D 1D 46 A0
C648:49 4C 54 45 52 53 0D 1D 83
C650:1D 52 45 53 4F 4E 41 4E 63
C658:43 45 0D 1D 1D 56 33 20 15
C660:46 52 45 51 0D 1D 1D 52 CC
C668:49 53 45 2F 46 41 4C 4C 27
C670:0D 1D 1D 56 33 20 57 41 DE
C678:56 45 46 4F 52 4D 0D 1D 3F
C680:1D 56 33 20 50 2E 57 49 CD
C688:44 54 48 0D 1D 1D 46 52 63
C690:45 51 2E 4D 4F 44 0D 00 55
C698:0F FF FE 03 FF 0F 0F 0F 27
C6A0:0F FE FE 01 01 FF 04 0F 84
C6A8:FF FF 03 FF 04 00 5D 17 88
C6B0:00 00 00 00 0F 0B 02 0D F3
C6B8:00 01 00 00 00 54 50 00 78
C6C0:00 00 5D 17 00 00 00 00 6B
C6C8:0F 0B 02 0D 00 01 00 00 B5
C6D0:00 54 50 00 00 00 1A 00 B1
C6D8:01 00 00 00 0F 0F FE 01 9A
C6E0:00 00 00 00 00 17 00 02 CC
C6E8:80 03 15 00 03 00 01 03 37
C6F0:0B 09 0B 80 00 00 00 00 AF
C6F8:00 00 00 00 00 00 0B DC 79
C700:00 00 00 00 0F 0B 03 80 BA
C708:00 00 00 00 00 00 00 00 97
C710:00 00 21 00 00 00 00 00 C3
C718:0F 01 02 02 01 01 00 00 DB
C720:00 17 18 00 00 00 14 01 A1
C728:01 00 01 00 0F 01 0E 07 F7
C730:00 00 00 00 00 00 00 00 BF
C738:00 00 10 80 03 00 00 00 E9
C740:0F 0F 1B 01 00 00 0A 01 A3
C748:0F 11 00 00 00 00 48 03 37
C750:01 00 00 00 0F 09 64 80 46
C758:00 00 00 00 00 00 00 00 E7
C760:00 00 2A B6 02 80 00 00 B2
C768:0F 0C 3A 80 00 00 00 00 D1
C770:00 00 00 00 00 00 02 00 04
C778:03 00 01 04 0D 0A 05 80 05
C780:00 00 00 00 00 00 00 00 10
C788:00 00 18 00 02 40 02 04 34
C790:0A 0A 04 80 00 00 00 00 30
C798:00 00 00 00 00 00 2F 03 89
C7A0:00 00 00 00 0F 0D A1 80 A0
C7A8:00 01 00 00 00 2F 20 00 75
C7B0:00 00 2A 01 01 00 00 00 9D
C7B8:0F 0C 29 DD 00 00 00 00 D5
C7C0:00 00 00 00 00 00 04 00 58
C7C8:01 00 00 00 0F 0C 12 80 26
C7D0:00 00 00 00 00 00 00 00 60
C7D8:00 00 46 07 03 00 00 00 B9
C7E0:0F 09 1B 80 00 00 00 00 A5
C7E8:00 00 00 00 00 00 3C 6D 5E
C7F0:02 80 00 00 0F 0B 28 80 17
C7F8:00 00 00 00 00 00 00 00 88
C800:00 00 00 00 00 00 00 00 91
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Cats 'N' Dogs

See instructions in article on page 50 before typing in.

Program 1: Cats 'N' Dogs—BASIC Program

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
      ALL RIGHTS RESERVED
KR 20 IFA=1THEN60
JG 30 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
AA 40 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
PQ 50 A=1:LOAD"CATS 'N' DOGS.M
      L",8,1
GJ 60 DIMA(7,7),S1(18),S2(18):
      POKE53281,14:POKE53280,6
      :V=53248:S=54272
GR 70 P1$="PLAYER 1":P2$="PLAY
      ER 2":POKEV+28,255:POKEV
      +29,0:POKEV+23,0
XE 80 POKEV+37,1:POKEV+38,10:P
      OKEV+27,0:FORN=0TO7:X=50
      +29*N
FQ 90 POKE835-N,X:POKE843-N,X-
      19:POKEV+39+N,0:NEXT
CG 100 POKEV,70:POKEV+1,60:POK
      EV+2,250:POKEV+3,60:POK
      EV+4,165:POKEV+5,220
JR 110 POKE2042,248:POKEV+21,7
      :GOSUB760
HE 120 FORN=54272TO54300:POKEN
      ,0:NEXT:FORN=2TO18:READ
      S1(N):NEXT
HB 130 FORN=2TO18:READS2(N):NE
      XT
GE 140 FORN=1TO7:POKEV+N*2,N*3
      4:NEXT:POKEV+37,1:POKEV
      +38,10:SYS16385
HH 150 H=0:VE=0:FORN=53000TO53
      098:POKEN,248:NEXT
PG 160 FORN=0TO6:FORI=0TO6:A(N
      ,I)=0:NEXT:NEXT
SP 170 M=0:PL=0:A=3:X=136:Y=50
      :POKE2040,253:POKE53248
      ,X:POKE53249,Y
CD 180 POKEV+16,0:POKEV+21,255
      :POKES+24,13
HD 190 TY=1:D1=7:FORN=0TO6:IFA
      (0,N)=0ORA(0,N)=3THENTY
      =0:D1=D1-1
GP 200 NEXT:IFTY=1THEN980
XK 210 IFD1<=3ORDC<>1THEN230
FF 220 DC=0:POKE53000+R1+R2*7,
      248:A(R2,R1)=0:POKE5305
      0+R1+R2*7,248
SB 230 J=56320+PL*JY:CO=1-CO:A
      D=55688+PL*240:FORN=0TO
      7:POKEAD+N,CO:NEXT
GP 240 GETY$:IFY$="{F1}"THENPO
      KEV+21,0:GOSUB760:GOTO1
      50
AR 250 FORN=2TO18:POKES+N,S2(N
      ):NEXT:IFK$="1"ANDPL=1T
      HEN610
FB 260 POKES+8,X+PL*14:JV=PEEK
      (J):FR=JVAND16:IFFR=0TH
      EN300
XE 270 JV=15-(JVAND15):IFJV=8T
      HENX=X+34:A=A+1:POKES+1
      1,17:IFX>238THENX=34:A=
      0
QQ 280 IFJV=4THENX=X-34:POKES+
      11,17:A=A-1:IFX<34THENX
      =238:A=6
XM 290 POKE53248,X:GOTO190
KG 300 B=0:IFA(B,A)=3THENGOSUB
      720:GOTO400
KE 310 IFA(B,A)<>0THEN190
GH 320 CO=0:AD=55688+PL*240:FO
      RN=0TO7:POKEAD+N,CO:NEX
      T
RX 330 Y=Y+18:POKE53249,Y:POKE
      S+11,19
KC 340 B=B+1:IFA(B,A)<>0ANDA(B
      ,A)<>3THENB=B-1:GOTO380
GK 350 FORW=1TO14:POKES+8,265-
      Y-PL*25:Y=Y+2:POKE53249
      ,Y:NEXT
KC 360 IFA(B,A)=3THENA(B,A)=0:
      GOSUB720:GOTO400
KP 370 IFB<6THEN340
DR 380 POKE53000+A+B*7,252+PL*
      2:A(B,A)=1-PL*2
PG 390 POKES+11,0:POKE53050+A+
      B*7,252+PL*2
KF 400 POKEV+21,254:M=M+1:IFM<
      7THEN420
EK 410 SYS16586:IFPEEK(853)=3T
      HEN480
FK 420 PL=1-PL:POKE2040,253+PL
      *2:X=136:Y=50
EH 430 A=3:POKE53248,X:POKE532
      49,Y:POKEV+21,255
QA 440 IFDC<>1THEN190
HM 450 POKE53000+R1+R2*7,248:A
      (R2,R1)=0:POKE53050+R1+
      R2*7,248
QA 460 R1=INT(RND(1)*7):R2=INT
      (RND(1)*7):IFA(R2,R1)<>
      0THEN460
KF 470 POKE53000+R1+R2*7,250:A
      (R2,R1)=3:POKE53050+R1+
      R2*7,250:GOTO190
QR 480 FORN=2TO18:POKES+N,S1(N
      ):NEXT:POKES+4,23:POKES
      +11,35
RB 490 IFPEEK(852)=252THENY=80
      :C1=C1+1:LI=10:N=C1:N$=
      STR$(C1)+"
HD 500 IFPEEK(852)=254THENY=20
      0:C2=C2+1:LI=16:N$=STR$
      (C2)+"
EA 510 CL=35:GOSUB600:PRINTN$:
      POKE2040,PEEK(852):POKE
      V,35:POKEV+16,1
QQ 520 POKEV+1,Y:POKEV+29,1:PO
      KEV+23,1:POKEV+21,255
JF 530 POKE53281,2:GOSUB570:FO
      RN=53000TO53048:POKEN,P
      EEK(852):NEXT
QE 540 GOSUB570:POKEV+29,255:G
      OSUB570:POKEV+23,255:GO
      SUB570
JE 550 POKEV+29,PEEK(V+29)AND1
      :GOSUB570:POKEV+23,PEEK
      (V+23)AND1:GOSUB570
SX 560 GOSUB590:POKES+4,0:POKE
      V+23,0:POKEV+29,0:POKE5
      3281,14:GOTO150
PX 570 FORW=1TO25:CO=1-CO:FORN
```

```
=ØTO7:POKEAD+N,CO:NEXT:
      NEXT:RETURN
CH 580 FORW=1TO300:NEXT:RETURN
HA 590 FORW=1TO1000:NEXT:RETUR
      N
DS 600 POKE214,LI:PRINT:POKE21
      1,CL:RETURN
PK 610 POKE855,Ø:SYS16793:R=PE
      EK(855):R=R-INT(R/7)*7
CJ 620 IFPEEK(853)<>3THENRA=IN
      T(RND(Ø)*4)+C1*2:IFRA=1
      THENR=INT(RND(Ø)*7)
KK 630 IFDC=1AND(C1-C2>2)AND(R
      =R1)THENR=INT(RND(Ø)*7)
JC 640 IFR=3ANDA(Ø,3)<>ØTHENR=
      INT(RND(Ø)*7):IFR=3THEN
      640
HD 650 IFR=3THEN710
FC 660 IFR>3THENAA=R-3:JV=8
FA 670 IFR<3THENAA=3-R:JV=4
MR 680 FORN=1TOAA:IFJV=8THENX=
      X+34:A=A+1:IFX>238THENX
      =34:A=Ø
RJ 690 IFJV=4THENX=X-34:A=A-1:
      IFX<34THENX=238:A=6
AJ 700 POKES+8,X+PL*14:POKES+1
      1,17:POKE53248,X:FORWA=
      1TO25:NEXT:NEXT
AR 710 GOTO300
AR 720 POKES+13,255:POKES+12,Ø
      :POKES+11,33:FORWA=1900
      ØTO2000STEP-250Ø
AJ 730 POKES+8,WA/300:FORN=1TO
      10:POKEV+39,N
RB 740 POKEV+1,Y-N:POKEV,X-N:N
      EXT:POKES+8,WA/156:NEXT
XP 750 POKES+11,Ø:POKEV+39,Ø:R
      ETURN
FQ 760 PRINT"{CLR}"TAB(11)"
      {2 DOWN}{YEL}{RVS} CATS
       'N' DOGS {4 DOWN}"
FP 770 PRINT"{RVS}{RIGHT}{BLK}
      PRESS{2 SPACES}1 {OFF}
      {WHT}{2 SPACES}TO PLAY
      {SPACE}COMPUTER"
XA 780 PRINT"{2 DOWN}{RIGHT}
      {RVS}{BLK}PRESS
      {2 SPACES}2 {OFF}{WHT}
      {2 SPACES}TO PLAY A FRI
      END":C1=Ø:C2=Ø:DC=Ø:JY=
      Ø
KH 790 GOSUB580:POKE2040,254+C
      :POKE2041,252+C:GETK$:I
      FK$=""THENC=1-C:GOTO790
ME 800 IFK$<>"1"ANDK$<>"2"THEN
      790
KD 810 IFK$="1"THENPRINT"
      {2 DOWN}{RIGHT}{RED}PLU
      G JOYSTICK INTO PORT 2"
      :P2$="COMPUTER":GOTO870
SM 820 PRINT"{2 DOWN}{RVS}
      {RIGHT}{BLK}HOW MANY JO
      YSTICKS? (PRESS 1 OR 2)
KJ 830 GETJ$:IFJ$=""THEN830
QR 840 IFJ$<>"1"ANDJ$<>"2"THEN
      830
HD 850 IFJ$="1"THENPRINT"
      {2 DOWN}{RIGHT}{RED}PLU
      G JOYSTICK INTO PORT 2"
      :GOTO870
AD 860 JY=1
BQ 870 PRINT"{2 DOWN}{RIGHT}
      {RVS}{66} DOG CATCHER ON
      ? (Y/N)
FE 880 GOSUB580:POKE2042,250+C
      :GETY$:IFY$=""THENC=1-C
      :GOTO880
EM 890 IFY$<>"Y"ANDY$<>"N"THEN
      880
KS 900 IFY$="Y"THENDC=1
XG 910 POKEV+21,Ø:GOSUB590:PRI
      NT"{CLR}":AC=55327:AS=1
      Ø55
GP 920 POKEAC,2:POKEAS,160:FOR
      N=1TO8:POKEAC+N,7:POKEA
      S+N,160:NEXT
KB 930 AC=AC+40:AS=AS+40:IFAS<
      2017THEN920
QA 940 PRINT"{HOME}"TAB(32)"
      {BLK}{RVS}CATS 'N'
      {DOWN}{6 LEFT}DOGS":LI=
      8:CL=32:GOSUB600
XR 950 PRINT"{RVS}"P1$:LI=14:G
      OSUB600:PRINT"{RVS}"P2$
      :RETURN
EE 960 DATAØ,Ø,Ø,194,255,Ø,Ø,Ø
      ,Ø,Ø,Ø,Ø,6,Ø,Ø,8,128
EB 970 DATAØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,8,Ø
      ,Ø,252,3,Ø,Ø,8,128
CA 980 LI=5:GOSUB600:PRINT"TIE
       GAME":GOSUB720:TY=Ø:GO
      SUB600
SE 990 PRINT"{YEL}{RVS}
      {8 SPACES}":GOTO150
```

Program 2: Cats 'N' Dogs—Machine Language Routine

```
3E00:00 28 00 00 28 00 00 96 5E
3E08:00 00 96 00 02 00 80 02 6A
3E10:55 80 09 55 60 08 00 20 11
3E18:25 55 58 A5 55 5A A0 00 37
3E20:0A 25 55 58 25 55 58 20 6A
3E28:00 08 25 55 58 25 69 58 23
3E30:20 AA 08 25 AA 58 25 AA 66
3E38:58 20 AA 08 25 AA 58 DE 22
3E40:00 28 00 00 28 00 00 96 9E
3E48:00 00 96 00 02 00 80 02 AA
3E50:55 80 09 55 60 08 00 20 51
3E58:25 55 58 A5 55 5A A0 00 77
3E60:0A 25 55 58 25 55 58 20 AA
3E68:00 08 25 55 58 25 69 58 63
3E70:20 AA 08 25 AA 58 25 AA A6
3E78:58 20 AA 08 25 AA 58 DE 62
3E80:00 01 54 00 15 54 00 0A CB
3E88:A8 00 03 E8 00 0F E8 00 56
3E90:02 F0 00 03 F0 00 01 50 54
3E98:00 05 54 00 15 54 00 13 ED
3EA0:E4 AA AA AA 55 F1 54 55 AA
3EA8:31 54 55 01 14 55 01 14 99
3EB0:14 01 04 00 01 04 00 0A 1A
3EB8:04 00 00 28 00 00 00 00 B9
3EC0:00 01 54 00 15 54 00 0A 0C
3EC8:A8 00 03 E8 00 0F E8 00 96
3ED0:01 F0 00 03 F2 00 01 58 2C
3ED8:00 05 64 00 15 94 00 13 31
3EE0:E4 00 29 54 00 F1 54 00 AA
3EE8:B0 50 02 00 50 09 00 50 09
3EF0:25 00 50 95 40 50 55 42 93
3EF8:90 55 50 10 01 54 A0 00 B8
3F00:03 03 00 03 CF 00 0F BB 49
3F08:C0 0F EF C0 3F 77 F0 3D AB
3F10:99 F0 3D 99 F0 37 67 70 7C
3F18:8E EE 02 CD 55 CF F3 57 DF
3F20:3C 28 A8 A0 0F FF F0 0F 4F
3F28:FF C0 02 AA 80 03 FF C0 92
3F30:03 FF C0 02 82 80 03 C0 45
3F38:F0 0A 00 A0 00 00 00 00 BB
3F40:00 00 00 03 03 00 03 CF DC
3F48:00 0F BB C0 0F EF C0 3F 07
3F50:77 F0 3D 55 F0 3D 99 F0 64
3F58:3F 67 F0 0E EE C0 0D 99 7D
3F60:C0 03 57 00 00 A8 00 0F 9C
3F68:FF C0 2B FF A0 3E AA 3C 0C
3F70:F3 FF 2C E3 FF 00 02 AA 5B
3F78:00 03 CF 00 02 8A 00 00 EB
3F80:00 50 00 01 54 00 01 56 1E
3F88:80 05 5A 80 06 5A 00 95 0B
3F90:5A 00 95 54 00 05 54 00 F0
3F98:15 50 00 00 50 00 00 F0 29
3FA0:00 00 50 00 00 54 00 00 7A
3FA8:55 00 00 56 00 00 56 80 64
3FB0:00 55 80 00 45 50 00 45 45
3FB8:50 00 41 50 00 85 5A 00 57
3FC0:00 50 00 01 54 00 01 58 60
3FC8:00 05 59 00 06 59 00 16 5F
3FD0:6A 00 15 6A 00 95 6A 00 F8
3FD8:95 6A 00 14 58 00 00 F0 B1
3FE0:00 00 50 00 00 54 00 00 BA
3FE8:55 00 00 56 00 00 56 80 A4
3FF0:00 55 80 00 45 50 00 45 85
3FF8:52 00 41 52 00 85 58 00 B4
4000:FC A9 00 8D 50 03 8D 51 3D
4008:03 78 A9 7F 8D 0D DC A9 59
4010:01 8D 1A D0 A9 07 8D 4C 95
4018:03 AD 3C 03 8D 12 D0 A9 3D
4020:1B 8D 11 D0 A9 38 8D 14 1E
4028:03 A9 40 8D 15 03 A9 07 84
4030:85 FB A9 CF 85 FC 58 60 D5
4038:AD 19 D0 8D 19 D0 C9 06 6E
4040:D0 03 4C C1 40 CE 4C 03 68
4048:10 05 A9 06 8D 4C 03 EE 3A
4050:50 03 AD 50 03 C9 7C D0 7D
4058:17 A9 00 8D 50 03 AD 51 E2
4060:03 D0 08 A9 01 8D 51 03 16
4068:4C 70 40 A9 00 8D 51 03 A9
4070:AE 4C 03 A9 07 8D 4D 03 62
4078:BD 44 03 8D 4F 03 0E 4D 12
4080:03 AC 4D 03 AD 4F 03 99 D1
4088:01 D0 4E 4D 03 AC 4D 03 C4
4090:B1 FB 18 6D 51 03 99 F8 85
4098:07 AD 1B D4 29 78 8D 01 FF
40A0:D4 CE 4D 03 AD 4D 03 D0 92
40A8:D5 A5 FB 18 69 07 85 FB EC
40B0:C9 38 D0 04 A9 07 85 FB EE
40B8:BD 3C 03 8D 12 D0 8A F0 3A
40C0:06 68 A8 68 AA 68 40 4C BD
40C8:31 EA A9 0E 8D 52 03 A0 0F
40D0:00 8C 56 03 A9 00 8D 55 2D
40D8:03 BE 05 42 E0 00 F0 31 69
40E0:BD EA CE C9 F8 F0 26 8D D6
40E8:54 03 BE 06 42 BD EA CE 3A
40F0:CD 54 03 F0 08 A9 00 8D 51
40F8:55 03 4C 0D 41 EE 55 03 B2
4100:20 F9 41 AD 55 03 C9 03 61
4108:D0 03 4C 98 41 C8 4C D9 66
4110:40 C8 CE 52 03 D0 BD A0 5B
4118:00 A2 00 8E 55 03 B9 3A 90
4120:CF C9 F8 F0 23 8D 54 03 26
4128:B9 3B CF CD 54 03 F0 08 C5
4130:A9 00 8D 55 03 4C 48 41 A9
4138:EE 55 03 20 F9 41 AD 55 6F
4140:03 C9 03 D0 03 4C 98 41 DF
4148:C8 E8 E0 06 D0 D0 C8 C0 02
4150:31 90 C6 A0 00 A2 00 8E 8B
4158:55 03 B9 3A CF C9 F8 F0 A9
4160:23 8D 54 03 B9 41 CF CD D2
4168:54 03 F0 08 A9 00 8D 55 32
4170:03 4C 84 41 EE 55 03 20 1F
4178:F9 41 AD 55 03 C9 03 D0 69
4180:03 4C 98 41 98 18 69 07 BD
4188:A8 E8 E0 06 D0 CC 98 38 39
4190:E9 29 A8 C0 07 90 BE 60 CB
4198:60 A9 00 8D 58 03 A2 02 A4
41A0:A0 31 88 C0 FF D0 09 E0 13
41A8:00 F0 4D CA CA 4C A0 41 C7
41B0:B9 3A CF C9 F8 D0 EB C0 D8
41B8:29 B0 07 B9 41 CF C9 F8 4E
41C0:F0 E0 8A 18 69 FC 99 3A 73
41C8:CF 8E 59 03 8C 5A 03 20 26
41D0:CA 40 AE 59 03 AC 5A 03 B6
41D8:A9 F8 99 3A CF AD 55 03 28
41E0:C9 03 F0 11 AD 56 03 CD D2
41E8:58 03 90 06 8D 58 03 8C 2B
41F0:57 03 4C A2 41 8C 57 03 81
41F8:60 AD 55 03 CD 56 03 90 50
4200:03 8D 56 03 60 65 5F 59 15
4208:53 00 6C 66 60 5A 54 00 3F
4210:73 6D 67 61 5B 55 00 7A 57
4218:74 6E 68 62 5C 56 00 7B 5D
4220:75 6F 69 63 5D 00 7C 76 F8
4228:70 6A 64 00 7D 77 71 6B 24
4230:00 53 5B 63 6B 00 52 5A 85
4238:62 6A 72 00 51 59 61 69 F2
4240:71 79 00 50 58 60 68 70 66
4248:78 80 00 57 5F 67 6F 77 8D
4250:7F 00 5E 66 6E 76 7E 00 11
4258:65 6D 75 7D 00 FF 00 00 71
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

GEOS Column WordCount Generator

Article on page 95.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
KR 20 PRINTCHR$(147)"
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
RD 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
EP 40 OPEN1,8,15:DF$="WORDCOUN
      T":GF$="WORDCOUNT":R$=CH
      R$(18)
KG 50 PRINT:PRINT:PRINT:PRINTR
      $DF$
FR 60 FORP=1TO16:P$=P$+CHR$(16
      0):NEXT:Z$=CHR$(0):GF$=L
      EFT$(GF$+P$,16)
SD 70 FORD=1TO7:READY:DI$=DI$+
      CHR$(Y):NEXT:DATA 0,6,87
      ,7,1,1,0
SC 80 PRINT:PRINT"WRITING "DF$
      "'S HEADER BLOCK":GOSUB1
      60:GOSUB200
XB 90 PRINT#1,"B-P";8;TB-2:GET
      #8,IT$,IS$:IT=ASC(IT$+Z$
      ):IS=ASC(IS$+Z$)
KP 100 PRINT#1,"B-P";8;TB-3:PR
      INT#8,Z$;:PRINT#1,"U2:"
      ;8;0;TD;SD:CLOSE8
RX 110 PRINT:PRINT"WRITING "DF
      $"'S APPLICATION FILE":
      GOSUB160:GOSUB200
KS 120 PRINT#8,CHR$(IT)CHR$(IS
      );DI$;:PRINT#1,"U2:";8;
      0;TD;SD
PD 130 PRINT#1,"U1:";8;0;IT;IS
      :PRINT#1,"B-P";8;0:PRIN
      T#8,CHR$(0)CHR$(255);
CM 140 PRINT#1,"U2:";8;0;IT;IS
EE 150 PRINT:PRINT:PRINTR$DF$"
       CREATED!":CLOSE8:CLOSE
       1:END
XE 160 PRINT#1,"S0:"+GF$:OPEN8
      ,8,8,+GF$+",U,W":GOSUB2
      80
KQ 170 READY:ON-(Y=-1)-2*(Y=-2
      )GOTO180,190:PRINT#8,CH
      R$(Y);:GOTO170
DA 180 FORZ=1TO171:PRINT#8,Z$;
      :NEXT: REM ONLY FOR HEA
      DER BLOCK!
SH 190 CLOSE8:RETURN
FE 200 TD=18:SD=1:OPEN8,8,8,"#
      "
AD 210 PRINT#1,"U1:";8;0;TD;SD
      :GOSUB280
JK 220 PRINT#1,"B-P";8;0:GET#8
      ,NT$,NS$
BR 230 FORDE=0TO7:TB=DE*32+5:P
      RINT#1,"B-P";8;TB
XJ 240 DN$="":FORD=1TO16:GET#8
      ,A$:DN$=DN$+A$:NEXT:PRI
      NT".";
KX 250 IFDN$=GF$THENPRINT:RETU
      RN
EC 260 NEXT:TD=ASC(NT$+Z$):SD=
      ASC(NS$+Z$):IFTDTHEN210
MX 270 PRINT:PRINTR$"FILE NOT
      {SPACE}FOUND!":CLOSE8:C
      LOSE1:END
FG 280 INPUT#1,EN,ED$,ET$,ES$:
      IFEN=0THENRETURN
AP 290 PRINTR$;EN,ED$,ET$;ES$:
      CLOSE8:CLOSE1:END
KJ 300 REM HEADER BLOCK INFO
JH 310 DATA 3,21,191,255,255,2
      55,128,0,1,156,226,1,13
      2,38,1,156,226,7
FE 320 DATA 132,130,29,156,231
      ,17,128,0,39,156,0,45,1
      32,0,121,156,0,193
AF 330 DATA 144,0,129,156,1,22
      5,128,2,145,136,1,225,1
      52,2,241,136,5,249
QS 340 DATA 136,7,249,156,3,24
      1,128,0,1,255,255,255,1
      31,6,0,0,4,112
RQ 350 DATA 7,0,4,103,101,111,
      67,111,117,110,116,-1
FG 360 REM APPLICATION DATA
EA 370 DATA 234,169,230,133,24
      ,169,0,133,25,160,90,56
      ,32,78,193,169,0,133
CM 380 DATA 251,169,16,133,252
      ,169,0,133,112,133,113,
      141,249,5,169,0,133,118
PA 390 DATA 169,16,133,119,32,
      161,194,138,240,8,160,5
      ,32,142,6,76,40,4
MR 400 DATA 165,12,133,253,165
      ,13,133,254,169,7,133,1
      6,169,48,133,22,169,6
AS 410 DATA 133,23,169,249,133
      ,12,169,5,133,13,169,16
      ,133,2,169,6,133,3
JQ 420 DATA 32,86,194,165,2,20
      1,2,208,3,76,44,194,201
      ,5,240,40,173,141
QC 430 DATA 132,201,1,208,5,16
      0,2,76,136,6,160,3,185,
      142,132,240,15,152
KP 440 DATA 24,105,8,205,137,1
      32,240,6,32,176,194,76,
      40,4,136,16,233,76
SQ 450 DATA 40,4,173,249,5,208
      ,5,160,3,76,136,6,169,2
      49,133,2,169,5
EM 460 DATA 133,3,32,116,194,1
      38,240,3,76,134,6,173,1
      9,132,133,4,173,20
RQ 470 DATA 132,133,5,169,0,13
      3,10,169,16,133,11,32,2
      28,193,138,240,3,76
XB 480 DATA 134,6,160,90,177,1
      0,201,49,208,6,162,23,1
      60,63,208,15,201,50
EC 490 DATA 208,6,162,26,160,6
      2,208,5,160,1,76,136,6,
      142,110,7,140,111
EG 500 DATA 7,32,164,5,138,240
      ,3,76,134,6,173,150,132
      ,205,111,7,144,5
PD 510 DATA 240,3,76,100,5,173
      ,110,7,24,101,122,133,1
      22,169,0,101,123,133
QA 520 DATA 123,160,0,32,93,5,
      177,122,240,76,32,203,5
      ,144,11,32,223,5
AR 530 DATA 176,239,201,12,208
      ,235,240,44,230,112,208
      ,2,230,113,32,93,5,177
AM 540 DATA 122,240,47,32,203,
      5,144,244,201,12,240,22
      ,32,223,5,176,235,201
KG 550 DATA 13,240,202,201,32,
      240,198,201,128,144,223
      ,160,6,76,136,6,32,122
KC 560 DATA 194,138,240,145,76
      ,134,6,230,122,208,2,23
      0,123,96,32,60,6,169
JJ 570 DATA 0,133,253,169,16,1
      33,254,169,125,133,2,16
      9,5,133,3,32,86,194
BQ 580 DATA 76,0,4,129,11,40,3
      2,149,5,11,96,32,249,5,
      11,40,48,156
AC 590 DATA 5,12,96,48,253,1,1
      7,72,0,24,70,105,108,10
      1,58,0,24,87
FQ 600 DATA 111,114,100,115,58
      ,0,169,0,133,6,169,80,1
      33,7,169,0,133,16
CA 610 DATA 133,122,169,16,133
      ,17,133,123,32,140,194,
      138,240,12,201,11,208,5
CJ 620 DATA 160,4,76,136,6,76,
      134,6,96,201,65,144,14,
      201,123,176,10,201
DE 630 DATA 97,176,4,201,91,17
      6,2,24,96,56,96,162,2,2
      21,10,6,240,5
PD 640 DATA 202,16,248,24,96,1
      65,122,24,125,13,6,133,
      122,144,2,230,123,56
QQ 650 DATA 96,64,64,64,64,64,
      64,64,64,64,64,64,64,64
      ,64,64,64,64
EP 660 DATA 17,23,16,26,3,4,12
      9,11,130,10,39,6,12,130
      ,20,253,16,4
KB 670 DATA 4,5,17,24,2,17,72,
      6,17,48,0,79,110,32,100
      ,105,115,107
KD 680 DATA 58,0,87,114,105,11
      6,101,32,73,109,97,103,
      101,0,160,4,169,32
QF 690 DATA 145,118,136,16,251
      ,160,4,132,116,169,0,13
      3,114,133,115,162,16,24
BD 700 DATA 38,112,38,113,38,1
      14,38,115,56,165,114,23
      3,10,168,165,115,233,0
GD 710 DATA 144,4,132,114,133,
      115,202,208,229,38,112,
      38,113,165,114,24,105,4
      8
QG 720 DATA 164,116,145,118,13
      6,165,112,5,113,208,198
      ,160,5,145,118,96,160,0
FH 730 DATA 32,142,6,76,0,4,15
      2,10,168,185,175,6,133,
      120,185,176,6,133
HG 740 DATA 121,169,166,133,2,
      169,6,133,3,76,86,194,1
      29,12,10,30,120,1
KH 750 DATA 17,72,0,189,6,209,
      6,235,6,9,7,32,7,63,7,8
      3,7,24
AH 760 DATA 69,114,114,111,114
      ,32,114,101,97,100,105,
      110,103,32,102,105,108,
      101
CG 770 DATA 0,24,103,101,111,8
      7,114,105,116,101,32,49
      ,46,120,32,111,114,32
SC 780 DATA 50,46,120,32,111,1
      10,108,121,0,24,73,110,
      115,101,114,116,32,110
XM 790 DATA 101,119,32,100,105
      ,115,107,32,105,110,116
      ,111,32,100,114,105,118
      ,101
PM 800 DATA 32,65,0,24,78,111,
      32,102,105,108,101,32,1
      19,97,115,32,115,101
SP 810 DATA 108,101,99,116,101
      ,100,33,0,24,80,65,71,6
      9,32,84,79,32,76
SC 820 DATA 65,82,71,69,32,70,
```

```
        79,82,32,69,86,65,76,85
        ,65,84,73,79
GE 830  DATA 78,33,0,24,69,114,
        114,111,114,32,114,101,
        97,100,105,110,103,32
BE 840  DATA 100,105,115,107,0,
        24,73,108,108,101,103,9
        7,108,32,99,104,97,114
CD 850  DATA 97,99,116,101,114,
        32,105,110,32,102,105,1
        08,101,0,0,0,-2
```

SpeedScript Justified

Article on page 84.

```
HE 10   REM COPYRIGHT 1988 COMPU
        TE! PUBLICATIONS, INC. -
         ALL RIGHTS RESERVED
FM 20   PRINT"{CLR}{BLU}
        {3 SPACES}COPYRIGHT 1988
         COMPUTE! PUB., INC."
KM 30   PRINTTAB(10)"ALL RIGHTS
        {SPACE}RESERVED{DOWN}"
AQ 40   GOSUB120: REM LOAD ML PR
        OGRAM
SR 50   POKE49242,16: REM MAX IN
        SERTIONS
RE 60   INPUT"FILENAME";N$:INPUT
        "LM, RM";LM,RM
PP 70   OPEN15,8,15:OPEN2,8,2,N$
        +",S,R":INPUT#15,E1$,E2$
        ,E3$,E4$
CG 80   IFE1$="00"THEN100
FK 90   PRINT:PRINTE1$;E2$;E3$;E
        4$:CLOSE15:END
HK 100  OPEN3,4,7:POKE781,LM:PO
        KE782,RM-1:SYS49152:PRI
        NT#3:CLOSE2:CLOSE3
JJ 110  CLOSE15:END
DJ 120  FORJ=49152TO49570:READA
        :X=X+A:POKEJ,A:NEXT
DG 130  IFX<>61941THENPRINT"ERR
        OR IN DATA STATEMENTS."
        :STOP
CS 140  RETURN
AQ 150  DATA 142,163,193,140,16
        4,193,169,0,141,165,193
        ,32,19,193
HS 160  DATA 32,225,255,208,6,3
        2,225,255,240,251,96,17
        3,168,193
AM 170  DATA 205,163,193,176,6,
        32,56,192,76,11,192,173
        ,165,193
EG 180  DATA 208,6,32,56,192,76
        ,11,192,32,79,192,76,11
        ,192,32
KR 190  DATA 204,255,162,3,32,2
        01,255,162,0,189,176,19
        3,32,210
KH 200  DATA 255,232,236,168,19
        3,144,244,96,56,173,164
        ,193,237
BH 210  DATA 167,193,141,169,19
        3,201,16,144,4,32,56,19
        2,96,201
XP 220  DATA 0,208,4,32,56,192,
        96,169,0,141,170,193,17
        4,163,193
KX 230  DATA 189,176,193,201,32
        ,208,4,232,76,113,192,1
        89,176,193
EH 240  DATA 201,32,208,15,172,
        170,193,138,153,176,194
        ,169,1,153
EQ 250  DATA 0,195,238,170,193,
        232,236,168,193,144,228
        ,172,169
KG 260  DATA 193,174,171,193,23
        6,170,193,144,2,162,0,2
        54,0,195
RD 270  DATA 232,236,170,193,14
        4,2,162,0,136,208,242,1
        42,171,193
XC 280  DATA 169,255,172,170,19
        3,153,176,194,32,204,25
        5,162,3
KD 290  DATA 32,201,255,162,0,1
        60,0,152,221,176,194,20
        8,54,169
DS 300  DATA 0,141,166,193,200,
        185,176,193,136,201,8,2
        08,3,238
AE 310  DATA 166,193,142,162,19
        3,189,0,195,170,169,32,
        32,210,255
SH 320  DATA 173,166,193,240,10
        ,169,8,32,210,255,169,9
        5,32,210
PB 330  DATA 255,202,208,233,17
        4,162,193,232,76,12,193
        ,185,176
EB 340  DATA 193,32,210,255,200
        ,204,168,193,144,184,96
        ,32,204
GB 350  DATA 255,162,2,32,198,2
        55,169,0,141,167,193,14
        1,168,193
KA 360  DATA 169,32,141,176,193
        ,32,207,255,170,32,183,
        255,41,64
GP 370  DATA 240,3,104,104,96,1
        38,201,1,208,6,141,165,
        193,76,40
MC 380  DATA 193,201,2,208,8,16
        9,0,141,165,193,76,40,1
        93,201,13
KK 390  DATA 208,62,238,167,193
        ,172,167,193,140,168,19
        3,153,176
QC 400  DATA 193,238,168,193,17
        4,163,193,189,176,193,2
        01,32,176
HM 410  DATA 23,201,27,208,6,20
        6,167,193,76,123,193,20
        1,8,208
PR 420  DATA 3,206,167,193,206,
        167,193,76,136,193,201,
        146,208
PM 430  DATA 3,206,167,193,232,
        236,168,193,144,213,96,
        172,168
ED 440  DATA 193,153,176,193,23
        8,168,193,201,32,240,14
        0,140,167
FB 450  DATA 193,76,40,193,7
```

Sprint II

See instructions in article on page 72 before typing in.

Program 1: Sprint II

```
8000:A2 7F B5 00 9D 00 7F CA 9F
8008:10 F8 A9 40 85 12 A9 00 50
8010:85 27 A9 10 85 31 A9 FE 17
8018:85 42 A9 FF 85 43 A9 00 2E
8020:85 44 20 8C 88 20 CF FF 26
8028:C9 0D F0 06 9D 81 98 E8 DC
8030:D0 F3 E0 00 D0 01 60 86 84
8038:0A A9 0D 20 D2 FF A9 00 36
8040:20 BD FF A9 0F A2 08 A0 0F
8048:0F 20 BA FF 20 C0 FF A9 DD
8050:00 85 3A A9 01 85 F7 A9 4C
8058:08 85 F8 A9 EE 85 2A A9 04
8060:92 85 2B A0 00 B1 2A 20 B6
8068:E3 8B E6 2A D0 02 E6 2B 45
8070:A5 2B C9 97 D0 04 A5 2A CD
8078:C9 D5 90 E9 A9 FF 85 F9 D6
8080:85 06 A9 7D 85 FA 85 07 FC
8088:A9 00 85 2E 8D FF 7D 85 DE
8090:17 85 18 85 1F A9 00 85 FE
8098:38 A9 C0 85 39 A9 02 20 25
80A0:8C 88 20 15 88 20 0D 8C CA
80A8:E0 00 D0 03 4C 30 82 A5 32
80B0:17 18 69 04 85 17 90 02 5C
80B8:E6 18 A0 00 A5 10 91 38 10
80C0:C8 A5 11 91 38 A5 38 18 AB
80C8:69 02 85 38 90 02 E6 39 C6
80D0:20 4D 8C A5 33 C9 3A F0 47
80D8:04 C9 80 90 04 A2 00 86 98
80E0:1F C9 86 D0 02 E6 1F C9 75
80E8:83 D0 5C 20 4D 8C A5 44 99
80F0:D0 0C E6 44 A5 F7 8D E3 8A
80F8:0B A5 F8 8D E7 0B A0 00 8D
8100:A5 F7 91 42 C8 A5 F8 91 8A
8108:42 A5 33 C9 22 D0 06 20 19
8110:4D 8C 4C 09 81 A5 34 D0 D2
8118:12 A5 33 C9 2C D0 08 A9 EE
8120:00 20 E3 8B 4C 0F 81 C9 CB
8128:3A F0 04 A5 33 D0 F2 A9 CB
8130:00 20 E3 8B A9 00 20 E3 E1
8138:8B A5 F7 85 42 A5 F8 85 E1
8140:43 20 03 8C 4C D3 80 C9 92
8148:22 D0 06 20 CE 81 4C D3 3C
8150:80 C9 8F D0 03 4C A5 80 1A
8158:20 C3 8C 90 4D 20 47 8D FD
8160:A5 1F D0 02 B0 47 20 F4 10
8168:81 A5 1D 18 69 04 85 0F 30
8170:A5 06 38 E5 0F 85 06 B0 78
8178:02 C6 07 A0 00 A5 1D 05 EE
8180:1E 91 06 C8 A5 0C 91 06 CA
8188:C8 A5 F9 38 E5 0C 85 F9 80
8190:91 06 C8 A5 FA E9 00 85 56
8198:FA 91 06 A2 00 C8 BD D1 D8
81A0:98 91 06 E8 E4 1D 90 F5 56
81A8:B0 03 20 4D 8C A5 33 F0 EF
81B0:03 4C D3 80 4C A5 80 A5 6A
81B8:06 38 E9 04 85 06 B0 02 F1
81C0:C6 07 A0 02 A5 F7 91 06 53
81C8:C8 A5 F8 91 06 60 20 B7 7B
81D0:81 A2 00 20 4D 8C F0 0A C7
81D8:C9 22 F0 06 20 E3 8B E8 58
81E0:D0 F1 84 0F A0 00 A9 30 D2
81E8:91 06 C8 8A 91 06 A4 0F F4
81F0:20 4D 8C 60 A5 1E D0 05 3B
81F8:A9 02 85 0C 60 A9 0A 85 06
8200:0C A5 1F F0 1D 20 74 91 4B
8208:20 D0 8C B0 05 A9 07 4C 17
8210:70 8A 20 DD 8C A5 33 C9 FC
8218:2C F0 F2 20 77 91 A5 13 30
8220:85 0C E6 0C A5 1E C9 20 E1
8228:F0 03 06 0C 60 E6 0C 60 FE
8230:E6 3A 20 CC FF A9 01 20 D0
8238:C3 FF A5 06 38 E5 17 85 41
8240:17 85 2C 85 19 A5 07 E5 63
8248:18 85 18 85 2D 85 1A A5 6F
8250:F7 8D 3D 08 A5 F8 8D 3E 47
8258:08 A9 04 20 8C 88 20 15 2A
8260:88 20 0D 8C E0 00 D0 03 C7
8268:4C 00 83 20 AC 8A A0 00 D6
8270:A5 10 91 2C C8 A5 11 91 D1
8278:2C C8 A5 F7 91 2C C8 A5 6E
8280:F8 91 2C A5 2C 18 69 04 DE
8288:85 2C 90 02 E6 2D 20 7C 36
8290:83 20 4D 8C A5 33 C9 3A 99
8298:F0 15 C9 80 90 3A A2 00 4F
82A0:DD 54 8B F0 13 E8 E0 1F 47
82A8:90 F6 A9 07 4C 70 8A 20 B2
82B0:4D 8C A5 33 D0 DE F0 A9 F4
82B8:E0 12 90 05 A9 09 4C 70 8F
82C0:8A 20 4D 8C 8A 0A AA A9 01
82C8:82 48 A9 B1 48 BD DD 82 E8
82D0:48 BD DC 82 48 A5 33 60 CC
82D8:A2 07 D0 E8 49 85 7E 86 7D
82E0:F9 86 C2 83 5E 85 C2 83 27
82E8:AE 85 CF 83 CD 84 8F 84 FC
82F0:07 88 D0 84 49 85 C9 83 75
82F8:C2 87 E0 85 F7 87 4E 85 B5
8300:20 7C 83 A9 60 20 E3 8B 18
8308:A5 F8 48 A5 F7 48 A5 1A C9
8310:C5 18 D0 06 A5 19 C5 17 AE
8318:B0 33 A0 00 B1 19 85 F7 4D
8320:C8 B1 19 85 F8 C8 B1 19 DA
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8328:85 13 C8 B1 19 85 14 20 12
8330:93 83 A0 02 B1 2A 20 E3 70
8338:8B C8 B1 2A 20 E3 8B A5 5D
8340:19 18 69 04 85 19 90 02 FA
8348:E6 1A 4C 0E 83 A9 05 20 A0
8350:8C 88 20 CC FF A9 01 20 59
8358:C3 FF A9 0F 20 C3 FF A2 1A
8360:7F BD 00 7F 95 00 CA 10 E0
8368:F8 68 85 2D 68 85 2E A5 E4
8370:F9 8D 1B 08 A5 FA 8D 1F 0F
8378:08 6C 02 A0 A5 2E F0 12 C2
8380:20 CD 8B A0 00 A5 F7 91 9E
8388:13 C8 A5 F8 91 13 C6 2E 24
8390:D0 EA 60 A5 17 85 2A A5 E9
8398:18 85 2B A0 00 B1 2A C5 5D
83A0:13 D0 07 C8 B1 2A C5 14 A8
83A8:F0 18 A5 2A 18 69 04 85 79
83B0:2A 90 02 E6 2B A5 2B C5 AB
83B8:2D D0 04 A5 2A C5 2C 90 B6
83C0:DA 18 60 A9 3A 20 A4 8C 0A
83C8:B0 05 68 68 4C 61 82 60 4A
83D0:20 80 8C 20 C3 8C B0 05 52
83D8:A9 0B 4C 70 8A A9 00 85 88
83E0:FD A9 B2 20 A4 8C B0 05 67
83E8:A9 18 4C 70 8A 20 4D 8C 57
83F0:20 F1 8D A5 33 48 A5 32 C8
83F8:85 41 20 8F 8C 20 47 8D 11
8400:A5 1E D0 04 A9 8D D0 0F F1
8408:C9 10 D0 48 20 B9 8B 20 B7
8410:5B 8F 20 CD 8B A9 9D 85 4F
8418:40 A5 3F F0 05 A9 10 4C DC
8420:70 8A 20 60 91 A9 02 20 65
8428:E3 8B A5 40 20 E3 8B 20 86
8430:03 8C 20 60 91 A9 03 20 41
8438:E3 8B E6 13 D0 02 E6 14 94
8440:A5 40 20 E3 8B 20 03 8C DD
8448:A5 FD D0 07 A5 41 85 32 9D
8450:68 85 33 60 A5 3F F0 C5 2D
8458:A9 A2 20 E3 8B E6 13 D0 10
8460:02 E6 14 A5 13 20 E3 8B 6D
8468:A9 A0 20 E3 8B A5 14 20 EB
8470:E3 8B 20 5A 91 A9 D8 20 FC
8478:E3 8B A9 08 20 E3 8B 20 D3
8480:63 91 A5 13 D0 02 C6 14 B5
8488:C6 13 20 03 8C 4C 48 84 98
8490:E6 2E 20 F1 8D A2 00 BD 70
8498:41 85 20 E3 8B E8 E0 09 B0
84A0:D0 F5 A5 F8 20 73 8B A5 5F
84A8:F7 20 73 8B 20 03 8C A9 AC
84B0:A7 20 A4 8C B0 0C A9 89 85
84B8:20 A4 8C B0 0E A9 0B 4C 11
84C0:70 8A 20 4D 8C 20 D0 8C 90
84C8:B0 04 60 20 4D 8C A9 4C 75
84D0:2C A9 20 20 E3 8B 20 CC BA
84D8:85 20 DD 8C 20 93 83 B0 38
84E0:53 A9 00 85 2A A9 C0 85 55
84E8:2B A0 00 B1 2A C5 13 D0 2A
84F0:07 C8 B1 2A C5 14 F0 1C 05
84F8:A5 2A 18 69 02 85 2A 90 04
8500:02 E6 2B A5 2B C5 39 D0 39
8508:04 A5 2A C5 38 90 DA A9 83
8510:0A 4C 70 8A A0 00 A5 19 53
8518:38 E9 04 85 19 B0 02 C6 E8
8520:1A A5 F7 91 19 C8 A5 F8 E9
8528:91 19 C8 A5 13 91 19 C8 8F
8530:A5 14 91 19 C8 B1 2A 20 58
8538:E3 8B C8 B1 2A 20 E3 8B 71
8540:60 A5 03 D0 07 A5 02 D0 F5
8548:03 4C A9 60 4C E3 8B 20 4C
8550:5A 91 A9 85 20 E3 8B A9 CB
8558:0B 20 E3 8B 4C 82 85 C9 67
8560:22 D0 12 20 6F 86 A9 3B 19
8568:20 A4 8C B0 05 A9 14 4C 8C
8570:70 8A 20 4D 8C 20 5A 91 5A
8578:A9 94 20 E3 8B A9 0B 20 F8
8580:E3 8B 20 C3 8C B0 05 A9 7B
8588:0B 4C 70 8A 20 47 8D A9 C5
8590:01 85 3F A5 1E C9 20 F0 09
8598:0F C6 3F 20 5A 91 A9 69 9C
85A0:20 E3 8B A9 0A 20 E3 8B E4
85A8:A9 01 85 FD 4C 00 84 20 E4
85B0:5A 91 A9 BB 20 E3 8B A9 8F
85B8:0B 20 E3 8B 20 82 85 A5 42
85C0:33 C9 2C D0 06 20 4D 8C 42
85C8:4C AF 85 60 20 9B 8E B0 D9
85D0:0F 20 C3 8C B0 05 A9 0B A4
85D8:4C 70 8A A9 07 4C 70 8A E6
85E0:60 A5 33 F0 2E C9 3B F0 FA
85E8:37 C9 3A F0 26 C9 A3 F0 E8
85F0:39 C9 A6 F0 45 C9 2C F0 89
85F8:51 20 F1 8D A5 3F D0 0D A4
8600:20 5A 91 A9 D9 20 E3 8B 23
8608:A9 0A 20 E3 8B 20 72 86 F6
8610:4C E1 85 20 5A 91 A9 B3 8E
8618:20 E3 8B A9 0B 4C E3 8B 17
8620:20 4D 8C F0 04 C9 3A D0 BD
8628:B8 60 20 63 86 A9 6D 20 B9
8630:E3 8B A9 0B 20 E3 8B 4C EB
8638:E1 85 20 63 86 A9 80 20 CD
8640:E3 A9 0B 20 E3 8B 4C E1 D4
8648:85 20 5A 91 A9 59 20 E3 5B
8650:8B A9 0B 20 E3 8B 20 4D CB
8658:8C F0 CD C9 3A F0 C9 4C B3
8660:E1 85 20 4D 8C 20 F1 8D EE
8668:20 77 91 4C 5A 91 20 F1 A5
8670:8D 20 5A 91 A9 ED 20 E3 D9
8678:8B A9 0B 4C E3 8B 20 80 E9
8680:8C 20 D0 83 20 8F 8C 20 A6
8688:47 8D 20 B9 8B A9 A4 20 A8
8690:A4 8C B0 05 A9 0B 4C 70 FB
8698:8A 20 4D 8C 20 CD 86 A5 50
86A0:33 C9 A9 D0 16 20 4D 8C 54
86A8:20 CD 86 A5 F8 20 80 8B 39
86B0:A5 F7 20 80 8B 20 CD 8B 9E
86B8:4C C3 8B A9 00 20 80 8B F5
86C0:A9 01 20 80 8B A9 00 20 12
86C8:80 8B D0 DF 20 9B 8E 90 2E
86D0:0B 20 DD 8C 20 C3 8B A9 C0
86D8:00 4C 80 8B 20 C3 8C B0 9B
86E0:05 A9 0B 4C 70 8A 20 47 36
86E8:8D 20 C3 8B A9 01 D0 E9 D2
86F0:A2 08 20 A3 8B CA D0 FA B3
86F8:60 20 C3 8C 90 1C 20 47 FB
8700:8D 20 A3 8B 85 2A AA 20 55
8708:A3 8B 85 2B C5 14 D0 04 53
8710:E4 13 F0 10 20 F1 86 4C 97
8718:02 87 20 A3 8B 85 2A 20 2F
8720:A3 8B 85 2B 20 D8 8B 20 E2
8728:B9 8B A9 02 85 28 85 3D 61
8730:20 A6 87 20 FF 8E 20 AF 16
8738:87 20 5A 91 A9 58 20 E3 4A
8740:8B A9 0A 20 E3 8B 20 A6 F6
8748:87 20 60 91 A9 02 20 E3 C1
8750:8B 20 63 91 20 03 8C 20 F8
8758:60 91 A9 03 20 E3 8B E6 EF
8760:13 D0 02 E6 14 20 63 91 55
8768:20 03 8C 20 AF 87 20 5A 12
8770:91 A9 5F 20 E3 8B A9 0A 4B
8778:20 E3 8B 20 60 91 A9 02 A2
8780:20 E3 8B A9 F0 20 E3 8B FF
8788:A9 03 20 E3 8B A9 4C 20 2B
8790:E3 8B 20 CD 8B 20 03 8C C4
8798:A5 33 C9 2C D0 06 20 4D 6F
87A0:8C 4C FA 86 60 A5 2A 85 44
87A8:13 A5 2B 85 14 60 A9 04 E1
87B0:85 28 20 A3 8B 48 20 D8 61
87B8:8B 68 D0 03 4C B7 8E 4C 9C
87C0:FF 8E 20 F1 8D 20 5A 91 C9
87C8:A9 FD 20 E3 8B A9 0B 20 A7
87D0:E3 8B A5 33 C9 2C F0 05 82
87D8:A9 12 4C 70 8A 20 4D 8C CD
87E0:20 F1 8D A2 00 BD F2 87 BC
87E8:20 E3 8B E8 E0 06 90 F5 37
87F0:60 A0 00 A5 02 91 14 20 51
87F8:F1 8D 20 5A 91 A9 B8 20 D2
8800:E3 8B A9 0B 4C E3 8B 20 F4
8808:5A 91 A9 E2 20 E3 8B A9 5F
8810:0B 4C E3 8B A5 0A A2 81 0B
8818:A0 98 20 BD FF A9 01 A2 CA
8820:08 A0 08 20 BA FF 20 C0 37
8828:FF 90 15 C9 00 F0 54 C9 D2
8830:05 D0 0D A9 15 20 8C 88 FE
8838:A9 16 20 8C 88 4C 84 88 77
8840:20 4F 88 A2 01 20 C6 FF 86
8848:20 CF FF 4C CF FF A2 0F F4
8850:20 C6 FF A2 00 20 CF FF 6D
8858:C9 0D F0 06 9D 00 02 E8 E9
8860:D0 F3 86 0E AD 00 02 C9 C3
8868:32 B0 01 60 A9 08 20 8C 1F
8870:88 A2 00 BD 00 02 20 D2 65
8878:FF E8 E4 0E 90 F5 A9 0D FD
8880:20 D2 FF A9 11 20 8C 88 9B
8888:4C 52 83 0A AA BD A5 88 85
8890:85 08 BD A6 88 85 09 A0 95
8898:00 B1 08 F0 06 20 D2 FF 7C
88A0:C8 D0 F6 60 D7 88 06 89 A5
88A8:19 89 25 89 25 89 31 89 21
88B0:49 89 59 89 67 89 7B 89 6E
88B8:90 89 A2 89 A9 89 A9 89 B1
88C0:B7 89 CD 89 DE 89 EC 89 E2
88C8:02 8A 10 8A 24 8A 36 8A 6A
88D0:49 8A 5D 8A 5D 8A 0D 0D B9
88D8:0D 53 50 52 49 4E 54 20 C0
88E0:49 49 20 20 20 20 0D 42 CC
88E8:41 53 49 43 20 43 4F 4D C6
88F0:50 49 4C 45 52 0D 0D 53 8E
88F8:4F 55 52 43 45 20 46 49 06
8900:4C 45 3A 20 00 0D 2A 2A 86
8908:2A 20 42 41 44 20 46 49 0D
8910:4C 45 20 2A 2A 2A 0D 00 55
8918:50 41 53 53 20 31 2E 2E 93
8920:2E 0D 0D 00 50 41 53 53 B0
8928:20 32 2E 2E 2E 0D 0D 00 40
8930:0D 43 4F 4D 50 49 4C 41 DA
8938:54 49 4F 4E 20 46 49 4E 91
8940:49 53 48 45 44 2E 0D 00 1F
8948:20 20 20 2A 2A 2A 20 45 99
8950:52 52 4F 52 3A 20 20 00 C2
8958:4E 4F 54 20 53 55 50 50 D3
8960:4F 52 54 45 44 00 2A 2A 2F
8968:2A 20 44 49 53 4B 20 45 03
8970:52 52 4F 52 20 2A 2A 2A 78
8978:0D 00 49 4C 4C 45 47 41 47
8980:4C 20 46 55 4E 43 54 49 51
8988:4F 4E 20 55 53 45 00 4E 2E
8990:4F 4E 2D 45 58 49 53 54 BB
8998:49 4E 47 20 4C 49 4E 45 38
89A0:00 53 59 4E 54 41 58 00 F0
89A8:54 4F 4F 20 4D 41 4E 59 0B
89B0:20 46 4F 52 53 00 49 4C ED
89B8:4C 45 47 41 4C 20 53 54 1E
89C0:41 54 45 4D 45 4E 54 20 33
89C8:55 53 45 00 4E 45 58 54 90
89D0:20 57 49 54 48 4F 55 54 B6
89D8:20 46 4F 52 00 54 59 50 F0
89E0:45 20 4D 49 53 4D 41 54 83
89E8:43 48 00 0D 43 4F 4D 50 C2
89F0:49 4C 41 54 49 4F 4E 20 6D
89F8:41 42 4F 52 54 45 44 0D 99
8A00:00 4D 49 53 53 49 4E 47 6A
8A08:20 43 4F 4D 4D 41 00 4D 79
8A10:49 53 53 49 4E 47 20 50 BD
8A18:41 52 45 4E 54 48 45 53 91
8A20:49 53 00 4D 49 53 53 49 0B
8A28:4E 47 20 53 45 4D 49 43 A4
8A30:4F 4C 4F 4E 00 2A 2A 2A F5
8A38:20 49 2F 4F 20 45 52 52 97
8A40:4F 52 20 2A 2A 2A 0D 00 4C
8A48:44 45 56 49 43 45 20 4E ED
8A50:4F 54 20 50 52 45 53 45 BE
8A58:4E 54 0D 00 4D 49 53 53 D4
8A60:49 4E 47 20 45 51 55 41 F3
8A68:4C 20 53 49 47 4E 00 A2 C0
8A70:FA 9A 48 A9 40 85 12 A9 33
8A78:10 85 31 A5 3A D0 03 20 B2
8A80:AC 8A A9 06 20 8C 88 68 D0
8A88:20 8C 88 A9 0D 20 D2 FF 0B
8A90:A9 3A 20 A4 8C B0 0A A5 38
8A98:3A D0 03 4C A5 80 4C 61 4D
8AA0:82 A5 3A D0 03 4C D3 80 26
8AA8:4C 94 82 A0 00 84 20 A5 5B
8AB0:10 85 2A A5 11 85 2B A2 66
8AB8:08 A0 00 A5 2B DD 24 8B F8
8AC0:D0 05 A5 2A DD 23 8B 90 F9
8AC8:12 A5 2A 38 FD 23 8B 85 32
8AD0:2A A5 2B FD 24 8B 85 2B 2F
8AD8:C8 D0 E0 E0 00 F0 08 C0 45
8AE0:00 D0 04 A5 20 F0 08 98 72
8AE8:09 30 20 D2 FF E6 20 CA 66
8AF0:CA 10 C6 A9 20 20 D2 FF 0A
8AF8:A0 00 84 34 B9 00 02 10 14
8B00:0A A6 34 D0 06 20 2D 8B EF
8B08:4C 19 8B C9 22 D0 06 45 3F
8B10:34 85 34 A9 22 20 D2 FF FA
8B18:C8 C4 0E 90 DF A9 0D 4C 9B
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8B20:D2 FF 01 00 0A 00 64 00 D9
8B28:E8 03 10 27 38 E9 7F AA FB
8B30:84 0F A0 FF CA F0 08 C8 54
8B38:B9 9E A0 10 FA 30 F5 C8 36
8B40:B9 9E A0 30 06 20 D2 FF 49
8B48:4C 40 8B 29 7F 20 D2 FF BB
8B50:A4 0F 60 80 81 82 83 85 34
8B58:86 87 88 89 8B 8C 8D 8E 76
8B60:8F 97 99 9E A1 B4 B6 B9 49
8B68:BB C2 C3 C4 C5 C6 C7 C8 74
8B70:C9 CA 84 0F A4 12 88 99 B8
8B78:00 7E 84 12 A4 0F 60 84 87
8B80:0F A4 27 88 C0 40 B0 05 23
8B88:A9 0D 4C 70 8A 99 00 7E 81
8B90:84 27 A4 0F 60 86 0F A6 1B
8B98:12 BD 00 7E E8 86 12 A6 3C
8BA0:0F 60 86 0F A6 27 BD 00 66
8BA8:7E E8 E0 01 D0 05 A9 0F 62
8BB0:4C 70 8A 86 27 A6 0F 60 16
8BB8:A5 14 20 73 8B A5 13 4C 48
8BC0:73 8B A5 14 20 80 8B A5 2A
8BC8:13 4C 80 8B 20 96 8B 85 3D
8BD0:13 20 96 8B 85 14 60 20 62
8BD8:A3 8B 85 13 20 A3 8B 85 B2
8BE0:14 60 84 0F A0 00 91 F7 BB
8BE8:E6 F7 D0 02 E6 F8 A5 F8 0B
8BF0:C9 C0 D0 04 A5 F7 C9 00 18
8BF8:B0 03 A4 0F 60 A9 0D 4C BE
8C00:70 8A A5 13 20 E3 8B A5 27
8C08:14 4C E3 8B A2 01 20 C6 93
8C10:FF 20 CF FF C9 00 D0 03 1E
8C18:AA F0 20 20 CF FF 20 CF 57
8C20:FF 85 10 20 CF FF 85 11 39
8C28:A2 00 20 CF FF C9 00 F0 AB
8C30:0A 9D 00 02 E8 E0 50 B0 F1
8C38:0B 90 EF 86 0E A9 00 85 FD
8C40:32 85 34 60 A9 01 20 8C 7E
8C48:88 4C 84 88 84 26 20 E1 B0
8C50:FF D0 03 4C 84 88 A4 32 84
8C58:C4 0E B0 1D B9 00 02 85 96
8C60:33 C8 C9 22 D0 04 45 34 F5
8C68:85 34 C9 20 D0 04 A5 34 A2
8C70:F0 E6 84 32 A4 26 A5 33 AB
8C78:60 A9 00 85 33 F0 F3 84 4E
8C80:26 A4 31 88 A5 32 99 00 AD
8C88:7E 84 31 A4 26 60 84 26 54
8C90:A4 31 B9 00 7E 85 32 C8 B6
8C98:84 31 A8 B9 FF 01 85 33 33
8CA0:A4 26 60 85 35 20 80 8C B1
8CA8:A5 33 F0 09 C5 35 F0 0A FE
8CB0:20 4D 8C D0 F7 20 8F 8C B7
8CB8:18 60 A5 34 D0 F2 E6 31 3F
8CC0:38 60 A5 33 C9 5B B0 05 18
8CC8:C9 41 90 01 60 18 60 A5 03
8CD0:33 C9 3A B0 05 C9 30 90 88
8CD8:01 60 18 60 A9 00 85 36 22
8CE0:85 13 85 14 85 15 A5 33 72
8CE8:C9 AB D0 05 E6 36 20 4D D9
8CF0:8C A5 32 85 37 20 D0 8C C0
8CF8:90 2F 29 CF 85 16 A5 14 2C
8D00:85 15 A5 13 0A 26 15 0A 26
8D08:26 15 65 13 85 13 A5 15 32
8D10:65 14 85 14 06 13 26 14 B1
8D18:A5 13 65 16 85 13 90 02 74
8D20:E6 14 20 4D 8C D0 CE F0 C2
8D28:0B A5 32 C5 37 D0 05 A9 85
8D30:07 4C 70 8A A5 36 F0 0D 8D
8D38:A9 00 38 E5 13 85 13 A9 0C
8D40:00 E5 14 85 14 60 A2 00 17
8D48:86 1E 20 C3 8C B0 05 20 BF
8D50:D0 8C 90 09 9D D1 98 E8 E7
8D58:20 4D 8C D0 ED C9 25 D0 27
8D60:05 20 4D 8C F0 2A C9 24 60
8D68:D0 09 A9 20 85 1E 20 4D 97
8D70:8C F0 1D C9 28 D0 19 A5 AA
8D78:1F D0 0B A9 20 C5 1E D0 78
8D80:0B A9 07 4C 70 8A A9 20 52
8D88:C5 1E F0 04 A9 10 85 1E 23
8D90:E0 10 90 02 A2 0F 86 1D CD
8D98:A5 06 85 22 A5 07 85 23 52
8DA0:20 E1 FF D0 03 4C 84 88 2C
8DA8:A0 00 B1 22 F0 40 29 0F 56
8DB0:85 20 C5 1D D0 28 B1 22 CD
8DB8:29 F0 C5 1E D0 20 C8 B1 89
8DC0:22 85 0C C8 B1 22 85 13 90
8DC8:C8 B1 22 85 14 A2 00 C8 45
8DD0:B1 22 DD D1 98 D0 07 E8 25
8DD8:E4 1D 90 F3 B0 11 A5 20 34
8DE0:18 69 04 65 22 85 22 90 35
8DE8:02 E6 23 4C A1 8D 18 60 BB
8DF0:20 80 8C A9 00 85 3F 20 1D
8DF8:9B 8E B0 25 C9 22 F0 19 BF
8E00:C9 C4 F0 15 C9 C7 90 04 35
8E08:C9 CB 90 0D C9 80 B0 11 A2
8E10:20 47 8D A5 1E C9 20 D0 44
8E18:08 20 8F 8C E6 3F 4C 86 4F
8E20:91 20 8F 8C A9 02 85 28 51
8E28:20 A6 8E A5 33 F0 4D C9 EC
8E30:AE D0 05 A9 07 4C 70 8A E8
8E38:C9 AA 90 40 C9 B4 B0 3C B9
8E40:E9 A9 85 FE A4 32 B9 00 BE
8E48:02 C9 B1 90 0F C9 B4 B0 D1
8E50:0B 38 E9 AF 18 65 FE 85 13
8E58:FE 20 4D 8C A9 04 85 28 FF
8E60:20 4D 8C 20 A6 8E A5 FE 2E
8E68:0A AA 20 5A 91 BD 7E 8E ED
8E70:20 E3 8B BD 7F 8E 20 E3 3E
8E78:8B 4C 2C 8E 60 3D 09 4B 32
8E80:09 59 09 84 09 3B 0A D3 FE
8E88:09 E0 09 25 0A 1B 0A 31 D7
8E90:0A 45 0A 3B 0A 4F 0A A6 41
8E98:3E 60 20 D0 8C B0 05 C9 F8
8EA0:AB F0 01 18 60 A9 01 2C 49
8EA8:A9 00 85 3D 86 3E 20 9B 28
8EB0:8E 90 30 20 DD 8C 20 5D FF
8EB8:91 A5 13 20 E3 8B A9 85 92
8EC0:20 E3 8B A5 28 20 E3 8B C7
8EC8:A5 3D F0 CB 20 5D 91 A5 22
8ED0:14 20 E3 8B A9 85 20 E3 BC
8ED8:8B A5 28 18 69 01 A6 3E 86
8EE0:4C E3 8B C9 80 90 06 20 9D
8EE8:A7 8F 4C 77 91 20 C3 8C DF
8EF0:B0 05 A9 0B 4C 70 8A 20 E6
8EF8:47 8D A5 1E D0 27 A9 AD D7
8F00:20 E3 8B 20 03 8C A9 85 BE
8F08:20 E3 8B A5 28 20 E3 8B 11
8F10:A5 3D F0 B6 A9 AD 20 E3 03
8F18:8B E6 13 D0 02 E6 14 20 1A
8F20:03 8C 4C D5 8E C9 20 D0 77
8F28:05 A9 10 4C 70 8A 20 B9 A2
8F30:8B 20 5B 8F 20 CD 8B A9 7A
8F38:BD 20 E3 8B 20 03 8C A9 43
8F40:85 20 E3 8B A5 28 20 E3 51
8F48:8B A9 BD 20 E3 8B E6 13 7F
8F50:D0 02 E6 14 20 03 8C 4C E8
8F58:D5 8E 20 74 91 20 9B 8E 24
8F60:90 18 20 DD 8C 20 5D 91 E0
8F68:A5 13 20 E3 8B A9 0A 20 98
8F70:E3 8B 20 77 91 A9 AA 4C B4
8F78:E3 8B 20 C3 8C B0 05 A9 87
8F80:0B 4C 70 8A 20 47 8D A5 CD
8F88:1E C9 00 F0 0E C9 10 D0 C0
8F90:05 A9 07 4C 70 8A A9 10 53
8F98:4C 70 8A A9 AD 20 E3 8B 27
8FA0:20 03 8C 4C 6E 8F A2 00 DD
8FA8:DD 54 8B F0 0A E8 E0 1F 21
8FB0:90 F6 A9 07 4C 70 8A E0 95
8FB8:12 B0 05 A9 0E 4C 70 8A 55
8FC0:8A E9 12 0A AA BD D2 8F 04
8FC8:48 BD D1 8F 48 4C 74 91 9C
8FD0:EA 8F EA 8F ED 8F ED 8F B8
8FD8:EA 8F 1B 90 B7 90 3B 90 C4
8FE0:59 90 7F 90 D9 90 FA 90 61
8FE8:20 91 20 A6 8E 20 5A 91 26
8FF0:A5 28 C9 02 D0 0C BD 12 8A
8FF8:90 20 E3 8B BD 13 90 4C 45
9000:E3 8B BD 12 90 18 69 03 89
9008:20 E3 8B BD 13 90 4C E3 D6
9010:8B 86 08 4D 08 68 08 76 D6
9018:08 5A 08 20 47 8D A9 AD 48
9020:20 E3 8B 20 03 8C A9 85 E0
9028:20 E3 8B A5 28 20 E3 8B 33
9030:20 5D 91 A9 00 20 E3 8B 59
9038:4C D5 8E A9 00 85 29 85 4F
9040:FC 20 FF 91 20 5A 91 A6 35
9048:28 BD 54 90 20 E3 8B BD E5
9050:55 90 4C E3 8B 69 0A 6C 8A
9058:0A A9 00 85 29 85 FC 20 BA
9060:FF 91 20 5A 91 A5 28 C9 CC
9068:02 D0 0A A9 2A 20 E3 8B BF
9070:A9 09 4C E3 8B A9 2D 20 ED
9078:E3 8B A9 09 4C E3 8B A9 E6
9080:02 85 28 20 A9 8E A9 A5 8B
9088:20 E3 8B A5 28 20 E3 8B 93
9090:A9 8D 20 E3 8B A9 00 20 4F
9098:E3 8B A9 7E 18 65 29 20 74
90A0:E3 8B 20 5D 91 A9 01 20 C5
90A8:E3 8B A9 85 20 E3 8B A9 7D
90B0:08 18 65 29 4C E3 8B A9 CD
90B8:02 85 28 20 A6 8E 20 5A 4D
90C0:91 A5 29 D0 0A A9 E6 20 2B
90C8:E3 8B A9 0A 4C E3 8B A9 47
90D0:E9 20 E3 8B A9 0A 4C E3 16
90D8:8B A9 02 85 28 20 80 8C 12
90E0:20 68 91 20 A9 8E 20 18 40
90E8:91 A5 32 85 41 20 8F 8C 11
90F0:A9 04 85 FC 20 FF 91 4C D8
90F8:44 91 A9 02 85 28 20 80 83
9100:8C 20 68 91 20 A9 8E 20 7C
9108:18 91 20 8F 8C A9 08 85 39
9110:FC 20 FF 91 4C 44 91 A5 0F
9118:33 85 72 A5 32 85 41 60 69
9120:A9 02 85 28 A9 0C 85 FC 51
9128:20 80 8C 20 68 91 20 A9 82
9130:8E 20 4D 91 20 68 91 20 4B
9138:A9 8E 20 18 91 20 8F 8C 12
9140:20 FF 91 A5 41 85 32 A5 2A
9148:72 85 33 60 20 5A 91 A9 A9
9150:FD 20 E3 8B A9 0B 4C E3 A5
9158:8B A9 20 2C A9 A9 2C A9 68
9160:A5 2C A9 8D 4C E3 8B A9 22
9168:2C 20 A4 8C B0 14 A9 12 42
9170:4C 70 8A A9 28 2C A9 29 30
9178:20 A4 8C B0 05 A9 13 4C B2
9180:70 8A 4C 4D 8C A9 00 85 6D
9188:FC 85 29 20 FF 91 A5 33 77
9190:F0 5D C9 AC 90 09 C9 B1 75
9198:B0 05 A9 07 4C 70 8A C9 FD
91A0:AA 90 4C C9 B4 B0 48 E9 46
91A8:A9 F0 07 A2 00 86 3F 38 B8
91B0:E9 06 85 FE A4 32 B9 00 4C
91B8:02 C9 B1 90 0E C9 B4 B0 40
91C0:0A 38 E9 B0 65 FE 85 FE 70
91C8:20 4D 8C A9 01 85 29 A9 95
91D0:00 85 FC 20 4D 8C 20 FF D3
91D8:91 A5 FE 0A AA 20 5A 91 CA
91E0:BD F1 91 20 E3 8B BD F2 4F
91E8:91 20 E3 8B 4C 8F 91 60 36
91F0:EC 08 22 0A 18 0A 2E 0A C0
91F8:42 0A 38 0A 4C 0A A5 33 70
9200:C9 22 D0 22 20 59 92 20 7A
9208:5D 91 A5 1D 20 E3 8B A9 18
9210:A2 20 E3 8B A5 13 20 E3 61
9218:8B A9 A0 20 E3 8B A5 14 30
9220:20 E3 8B 4C BD 92 C9 80 D0
9228:90 06 20 A7 8F 4C 77 91 C3
9230:20 C3 8C B0 05 A9 0B 4C 24
9238:70 8A 20 47 8D A5 1E C9 B9
9240:20 F0 05 A9 10 4C 70 8A 0A
9248:A9 AD 20 E3 8B 20 03 8C 5F
9250:E6 13 D0 02 E6 14 D0 B7 C8
9258:20 4D 8C C9 22 F0 04 A9 95
9260:22 85 34 A2 00 A5 33 F0 96
9268:0D C9 22 F0 09 D1 98 D4
9270:20 4D 8C E8 D0 EF 86 1D 89
9278:20 4D 8C A5 06 85 22 A5 1D
9280:07 85 23 A0 00 B1 22 C9 CD
9288:30 D0 21 C8 B1 22 C5 1D 69
9290:D0 18 C8 B1 22 85 13 C8 6E
9298:B1 22 85 14 A0 FF C8 C4 6C
92A0:1D F0 18 B1 13 D9 D1 98 EA
92A8:F0 F4 A9 30 29 0F 18 69 DA
92B0:04 65 22 85 22 90 CC E6 A1
92B8:23 D0 C8 60 20 5A 91 A6 F6
92C0:FC A5 29 D0 0C BD DE 92 A7
92C8:20 E3 8B BD DF 92 4C E3 0A
92D0:8B BD E0 92 20 E3 8B BD D5
92D8:E1 92 4C E3 8B A8 08 C0 2B
92E0:08 06 0C 0B 0C 10 0C 16 8C
92E8:0C 2B 0C 31 0C 0B 08 0A 1A
92F0:00 9E 32 30 36 31 00 00 7D
92F8:00 A9 FF 8D 0E D4 8D 0F 4F
9300:D4 A9 80 8D 12 D4 A9 00 1C
9308:85 02 A9 00 85 03 A0 00 21
9310:98 91 02 E6 02 D0 02 E6 D4
```

```
9318:03 A5 03 C9 7E D0 04 A5 0C
9320:02 C9 00 90 E9 20 E2 0B 64
9328:4C FF FF A9 00 38 F5 02 DE
9330:95 02 A9 00 F5 03 95 03 C1
9338:60 A2 00 2C A2 02 B5 03 86
9340:10 03 20 3F 08 60 A2 00 2F
9348:2C A2 02 A1 02 95 02 A9 9C
9350:00 95 03 60 A2 00 2C A2 53
9358:02 A9 00 95 03 A5 D3 95 30
9360:02 60 A2 00 2C A2 02 AD 92
9368:1B D4 95 02 AD 1B D4 95 3E
9370:03 60 A2 00 2C A2 02 B5 2B
9378:03 D0 05 B5 02 D0 01 60 07
9380:B5 03 30 09 A9 00 95 03 55
9388:A9 01 95 02 60 A9 FF 95 D6
9390:02 95 03 60 86 06 84 07 E0
9398:8D B2 08 A0 00 C0 00 F0 32
93A0:08 B1 06 99 00 7E C8 D0 EE
93A8:F4 84 08 60 86 06 84 07 CE
93B0:8D CA 08 A0 00 C0 00 F0 50
93B8:08 B1 06 99 00 7F C8 D0 0B
93C0:F4 84 09 60 86 06 84 07 07
93C8:A0 00 C4 08 F0 08 B9 00 74
93D0:7E 91 06 C8 D0 F4 98 60 D4
93D8:A2 00 A4 08 E4 09 F0 0A 9D
93E0:BD 00 7F 99 00 7E E8 C8 05
93E8:D0 F2 84 08 60 A9 00 85 75
93F0:03 85 05 A5 08 85 02 A5 F5
93F8:09 85 04 A2 FF E8 E4 08 26
9400:F0 13 E4 09 F0 0F BD 00 D2
9408:7E DD 00 7F F0 EF 85 02 34
9410:BD 00 7F 85 04 60 A2 00 47
9418:2C A2 02 A9 00 95 03 A5 DC
9420:08 F0 03 AD 00 7E 95 02 EB
9428:60 A5 04 18 65 02 85 02 2D
9430:A5 05 65 03 85 03 60 A5 E8
9438:02 38 E5 04 85 02 A5 03 EF
9440:E5 05 85 03 60 A9 00 85 AD
9448:0A 85 0B A2 0F 06 0A 26 2E
9450:0B 06 02 26 03 90 0D A5 3D
9458:0A 18 65 04 85 0A A5 0B 24
9460:65 05 85 0B CA 10 E6 A5 E8
9468:0A 85 02 A5 0B 85 03 60 67
9470:A2 00 86 0A 86 0B A0 00 FD
9478:A5 03 10 04 C8 20 3F 08 C4
9480:A2 02 A5 05 10 04 88 20 42
9488:3F 08 A2 0F 06 02 26 03 20
9490:26 0A 26 0B A5 0B C5 05 AE
9498:D0 04 A5 0A C5 04 90 12 F1
94A0:A5 0A E5 04 85 0A A5 0B C6
94A8:E5 05 85 0B E6 02 D0 02 4A
94B0:E6 03 CA 10 D7 C0 00 F0 1B
94B8:05 A2 00 20 3F 08 60 A5 8F
94C0:02 25 04 85 02 A5 03 25 DE
94C8:05 85 03 60 A5 02 05 04 7F
94D0:85 02 A5 03 05 05 85 03 6C
94D8:60 A5 03 30 11 A5 05 30 58
94E0:0B A5 03 C5 05 D0 04 A5 CE
94E8:02 C5 04 60 38 60 A5 05 9E
94F0:30 EF A9 01 18 60 A9 FF 09
94F8:85 02 85 03 60 A9 00 85 75
9500:02 85 03 60 20 01 09 20 2B
9508:ED 09 F0 EA D0 EF 20 01 C0
9510:09 20 ED 09 F0 E7 90 E5 44
9518:B0 DC 20 01 09 20 ED 09 94
9520:B0 DB 90 D2 20 01 09 20 11
9528:ED 09 F0 D1 D0 C8 20 01 B2
9530:09 20 ED 09 90 C7 B0 BE F9
9538:20 01 09 20 ED 09 F0 B6 03
9540:90 B4 B0 B9 A5 05 85 17 F5
9548:4C 3D 09 A5 17 30 03 4C 30
9550:4F 0A 4C 45 0A A2 00 2C 8A
9558:A2 02 A5 08 85 0F E0 02 B6
9560:D0 04 A5 09 85 0F A0 00 E3
9568:98 95 02 95 03 85 0C 85 AA
9570:0E C4 0F F0 3E B9 00 7E 1C
9578:C9 2D D0 04 E6 0E D0 30 6F
9580:C9 30 90 2F C9 3A B0 2B 65
9588:E9 2F 85 0D B5 03 85 0C C6
9590:B5 02 0A 26 0C 0A 26 0C 9B
9598:75 02 95 02 A5 0C 75 03 1D
95A0:95 03 16 02 36 03 B5 02 65
95A8:65 0D 95 02 90 02 F6 03 1A
95B0:C8 D0 BE A5 0E F0 03 20 01
95B8:3F 08 60 01 00 0A 00 64 2E
95C0:00 E8 03 10 27 20 E6 0A 19
95C8:A6 08 A9 20 9D 00 7E E6 51
95D0:08 60 A9 7E 2C A9 7F 8D C9
95D8:47 0B 38 E9 76 8D 50 0B A5
95E0:A0 00 84 0C A9 20 8D 00 96
95E8:7E A5 03 10 0A A9 2D 8D FC
95F0:00 7E A2 00 20 3F 08 C8 E6
95F8:A2 08 A9 00 85 0D A5 03 5B
9600:DD D0 0A D0 05 A5 02 DD 3F
9608:CF 0A 90 13 A5 02 38 FD 86
9610:CF 0A 85 02 A5 03 FD D0 7E
9618:0A 85 03 E6 0D D0 DF E0 C6
9620:00 F0 0A A5 0D C9 00 D0 85
9628:04 A5 0C F0 0A A5 0D 09 5B
9630:30 99 00 7E C8 E6 0C CA 88
9638:CA 10 BF 84 00 60 46 3C 59
9640:32 28 1E 14 0A A2 06 A5 22
9648:D3 DD 52 0B 90 06 CA 10 14
9650:F6 4C B3 0B BD 52 0B 85 06
9658:02 A5 02 38 E5 D3 AA E0 68
9660:00 F0 08 A9 20 20 D2 FF 8C
9668:CA 10 F4 60 A5 02 4C 5F D0
9670:96 A9 00 85 08 20 E4 FF 36
9678:F0 05 8D 00 7E E6 08 60 11
9680:A5 B8 F0 0A A9 3F 20 D2 CA
9688:FF A9 20 20 D2 FF A2 00 02
9690:20 CF FF C9 0D F0 06 9D 34
9698:00 7E E8 D0 F3 86 08 A9 03
96A0:0D 4C D2 FF 6C 02 00 A4 D1
96A8:12 A2 00 B1 10 F0 07 9D 92
96B0:00 7E C8 E8 D0 F5 86 08 98
96B8:C8 B1 10 D0 0E C8 B1 10 CC
96C0:48 C8 B1 10 85 11 68 85 42
96C8:10 A0 00 84 12 60 A9 00 D3
96D0:85 10 A9 00 85 11 4C DD E0
96D8:0B A2 00 E4 08 F0 09 BD 56
96E0:00 7E 20 D2 FF E8 D0 F3 18
96E8:60 A5 02 85 14 A5 03 85 0B
96F0:15 60 A5 02 4C A8 08 A5 50
96F8:02 4C C0 08 20 1C 0C 4C A8
9700:A8 08 20 1C 0C 4C C0 08 66
9708:86 14 38 E5 02 18 65 14 34
9710:AA 90 01 C8 A5 02 60 20 7B
9718:37 0C 4C A8 08 20 37 0C 35
9720:4C C0 08 C6 14 8A 18 65 73
9728:14 AA 90 01 C8 A5 02 60 6F
9730:0F 08 0F 00 00 20 D0 97 84
9738:AD 31 97 4C C3 FF 4C E7 E0
9740:FF 20 D0 97 AE 31 97 4C C0
9748:C9 FF 20 D0 97 AE 31 97 DE
9750:4C C6 FF 4C CC FF 20 D0 93
9758:97 AD 31 97 AE 32 97 AC 78
9760:33 97 20 BA FF 20 BC 97 50
9768:4C C0 FF 20 D0 97 AD 32 62
9770:97 20 BA FF 20 BC 97 A5 93
9778:C3 48 A5 C4 48 A5 2B 85 51
9780:C3 A5 2C 85 C4 A9 C3 A6 D3
9788:2D A4 2E 20 D8 FF 68 85 5C
9790:C4 68 85 C3 60 20 B7 FF 1C
9798:8D 35 97 60 20 D0 97 AD F5
97A0:32 97 A2 01 AC 33 97 20 B4
97A8:BC 97 AD 31 97 A6 2B A4 37
97B0:2C 20 D5 FF 86 2D 84 2E D8
97B8:4C C6 97 AD 34 97 A2 D5 A8
97C0:A0 97 4C BD FF A9 00 20 52
97C8:90 FF 68 68 4C 59 A6 A9 92
97D0:C0 4C 90 FF 00 00 00 00 85
```

Program 2: Sprint II File Routines

```
BX 60000 IFLEN(OP$)=0THEN60020
QK 60010 VX=LEN(OP$):FORVV=1TO
         VX:CC$=MID$(OP$,VV,1)
         :POKE38868+VV,ASC(CC$
         ):NEXTVV
HS 60020 POKE38708,LEN(OP$):RE
         TURN
KP 60100 CC$="":OP$="":SYS3873
         1
GC 60110 GETCC$:IFCC$<>CHR$(13
         )THENOP$=OP$+CC$:GOTO
         60110
HC 60120 SYS38740:O9$=OP$
HD 60130 IFO9$=""THENRETURN
FX 60140 IFLEFT$(O9$,1)=" "THE
         NOP=LEN(O9$)-1:O9$=RI
         GHT$(O9$,OP):GOTO6013
         0
SK 60150 OP=VAL(O9$):RETURN
```

Program 3: Doodler

```
AC 100 POKE53280,0:POKE53281,2
       :PRINT"{CLR}{3 DOWN}
       {WHT}"TAB(15)"64 DOODLE
       R"
KB 110 PRINT"{2 DOWN}{BLK}"TAB
       (8)"PLUG JOYSTICK INTO
       {SPACE}PORT 2"
EP 120 PRINT"{DOWN}"TAB(9)"USE
        IT TO DRAW PICTURES"
CR 130 PRINT"{DOWN}"TAB(10)"TR
       IGGER CLEARS SCREEN":PR
       INT"{4 DOWN}{WHT}"TAB(1
       4)"PRESS ANY KEY"
ER 140 GETA$:IFA$=""THEN140
EG 150 PRINT"{CLR}":FORI=0TO7:
       READP(I):NEXT:DATA1,2,4
       ,8,16,32,64,128
EH 160 FORI=0TO10:READDX(I),DY
       (I):NEXT
RR 170 DATA0,0,0,-1,0,1,0,0,-1
       ,0,-1,-1,-1,1,0,0,1,0,1
       ,-1,1,1
GF 180 POKE53272,PEEK(53272)OR
       8:POKE53265,PEEK(53265)
       OR32
PH 190 GOSUB300:FORI=1024TO202
       3:POKEI,2:NEXT
CA 200 X=160:Y=100
JS 210 GOSUB280:J=PEEK(56320):
       K=JAND16:IFK=0THENGOSUB
       300
CB 220 J=JAND15:J=15-J:X=X+DX(
       J):Y=Y+DY(J)
SS 230 IFX>319THENX=0
AX 240 IFX<0THENX=319
CA 250 IFY>199THENY=0
QE 260 IFY<0THENY=199
BQ 20 GOTO210
ME 280 RO%=Y/8:CH%=X/8:LI=YAND
       7:BI=XAND7:BI=7-BI:B1=R
       O%*320:B2=CH%*8
DD 290 BY=8192+B1+B2+LI:POKEBY
       ,PEEK(BY)ORP(BI):RETURN
GF 300 FORI=8192TO16383:POKEI,
       0:NEXT:RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Condensed Font

Article on page 83.

Program 1: Condensed Font—Main Program

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RQ 20 C=49152:IFPEEK(65530)=5T
      HENBANK15:C=4864:REM 64/
      128
GE 30 IFPEEK(65530)=164THENPOK
      E56,62:POKE55,0:CLR:C=15
      872:REM PLUS4/16
```

```
DK 40 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
PA 50 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
DH 60 FORI=CTOC+191:READA:POKE
      I,A:X=X+A:NEXT:REM CHARS
MF 70 IFX<>35784THENPRINT"CHEC
      K DATA LINES 80-180.":ST
      OP
BP 80 DATA128,128,128,128,223,
      128,135,128,135,255,148,
      255,166,235,178,241,136,
      199
BK 90 DATA246,201,214,132,130,
      129,156,162,193,193,162,
      156,148,136,148,136,156,
      136
KM 100 DATA192,176,128,136,136
      ,136,224,224,128,224,15
      6,131,190,197,190,194,2
      55,192
BD 110 DATA226,209,206,162,201
      ,182,158,144,255,199,19
      7,185,188,202,177,225,1
      53,135
FP 120 DATA182,201,182,198,169
      ,158,128,146,128,192,17
      8,128,136,148,162,148,1
      48,148
AH 130 DATA162,148,136,130,209
      ,142,190,201,166,254,13
      7,254,255,201,182,190,1
      93,162
RR 140 DATA255,193,190,255,201
      ,193,255,137,129,255,19
      3,241,255,136,255,193,2
      55,193
BD 150 DATA193,255,129,255,136
      ,247,255,192,192,255,13
      4,255,255,129,254,190,1
      93,190
EP 160 DATA255,137,134,158,161
      ,254,255,137,246,166,20
      1,178,129,255,129,255,1
      92,255
DC 170 DATA191,192,191,255,176
      ,255,247,136,247,143,24
      8,143,241,201,199,255,1
      93,193
QX 180 DATA254,201,194,193,193
      ,255,134,255,134,136,15
      6,170
```

Program 2: Condensed Font—Customizer For 64

```
QQ 200 FORI=50000TO50158:READA
       :POKEI,A:X=X+A:NEXT:REM
        64
XR 210 IFX<>20549THENPRINT"CHE
       CK DATA LINES 220-370."
       :STOP
HS 220 DATA 169,91,141,38,3,16
       9,195,141,39,3
HK 230 DATA 96,133,2,201,18,20
       8,5,169,1,141
KM 240 DATA 93,193,201,13,240,
       105,201,141,240,101
KE 250 DATA 201,146,240,97,201
       ,32,144,79,201,96
BJ 260 DATA 176,75,138,72,152,
       72,8,165,2,56
MJ 270 DATA 233,32,141,92,193,
       162,3,169,0,24
AH 280 DATA 109,92,193,202,208
       ,250,168,169,8,32
FF 290 DATA 202,241,162,3,185,
       0,192,72,173,93
QM 300 DATA 193,201,1,240,56,1
       04,32,202,241,200
HP 310 DATA 202,208,237,173,93
       ,193,201,1,240,5
SG 320 DATA 169,128,76,187,195
       ,169,255,32,202,241
MC 330 DATA 40,104,168,104,170
       ,169,15,76,202,241
KQ 340 DATA 169,202,141,38,3,1
       69,241,141,39,3
HM 350 DATA 96,169,0,141,93,19
       3,165,2,76,197
EB 360 DATA 195,104,56,233,128
       ,141,94,193,169,127
DX 370 DATA 237,94,193,24,105,
       128,76,166,195
```

Program 3: Condensed Font—Customizer For 128

```
ME 200 FORI=5100TO5258:READA:P
       OKEI,A:X=X+A:NEXT:REM 1
       28
EH 210 IFX<>19596THENPRINT"CHE
       CK DATA LINES 220-370."
       :STOP
QM 220 DATA 169,247,141,38,3,1
       69,19,141,39,3
CX 230 DATA 96,133,250,201,18,
       208,5,169,1,141
PF 240 DATA 234,19,201,13,240,
       105,201,141,240,101
KE 250 DATA 201,146,240,97,201
       ,32,144,79,201,96
GA 260 DATA 176,75,138,72,152,
       72,8,165,250,56
HA 270 DATA 233,32,141,233,19,
       162,3,169,0,24
MQ 280 DATA 109,233,19,202,208
       ,250,168,169,8,32
QD 290 DATA 121,239,162,3,185,
       0,19,72,173,234
HM 300 DATA 19,201,1,240,56,10
       4,32,121,239,200
KC 310 DATA 202,208,237,173,23
       4,19,201,1,240,5
EE 320 DATA 169,128,76,87,20,1
       69,255,32,121,239
PH 330 DATA 40,104,168,104,170
       ,169,15,76,121,239
AS 340 DATA 169,121,141,38,3,1
       69,239,141,39,3
FH 350 DATA 96,169,0,141,234,1
       9,165,250,76,97
DK 360 DATA 20,104,56,233,128,
       141,235,19,169,127
DB 370 DATA 237,235,19,24,105,
       128,76,66,20
```

Program 4: Condensed Font—Customizer For Plus/4 and 16

```
DB 200 FORI=16128TO16286:READA
       :POKEI,A:X=X+A:NEXT:REM
        PLUS 4/16
SS 210 IFX<>19620THENPRINT"CHE
       CK DATA LINES 220-370."
       :STOP
RA 220 DATA 169,11,141,36,3,16
       9,63,141,37,3
EQ 230 DATA 96,133,161,201,18,
       208,5,169,1,141
EG 240 DATA 254,62,201,13,240,
       105,201,141,240,101
KE 250 DATA 201,146,240,97,201
       ,32,144,79,201,96
JG 260 DATA 176,75,138,72,152,
       72,8,165,161,56
MA 270 DATA 233,32,141,253,62,
       162,3,169,0,24
KR 280 DATA 109,253,62,202,208
       ,250,168,169,8,32
BJ 290 DATA 75,236,162,3,185,0
       ,62,72,173,254
BC 300 DATA 62,201,1,240,56,10
       4,32,75,236,200
GC 310 DATA 202,208,237,173,25
       4,62,201,1,240,5
KG 320 DATA 169,128,76,107,63,
       169,255,32,75,236
BS 330 DATA 40,104,168,104,170
       ,169,15,76,75,236
MM 340 DATA 169,75,141,36,3,16
       9,236,141,37,3
KD 350 DATA 96,169,0,141,254,6
       2,165,161,76,117
RS 360 DATA 63,104,56,233,128,
       141,255,62,169,127
AE 370 DATA 237,255,62,24,105,
       128,76,86,63
```

Needlework Graphics Editor

See instructions in article on page 52 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 80 8D 8A A6
0811:02 A9 8E 20 D2 FF AD 0B 5D
0819:11 8D 20 D0 A9 00 8D 21 AF
0821:D0 20 0E 09 A9 0E 20 D2 8C
0829:FF A9 08 20 D2 FF 20 12 8F
0831:0D A9 2B 8D 28 04 20 E4 E6
0839:FF F0 FB C9 0C D0 06 20 71
0841:F1 09 4C 37 08 C9 06 D0 CD
0849:06 20 3A 0A 4C 37 08 C9 65
0851:10 D0 06 20 8E 0A 4C 37 CC
0859:08 C9 87 D0 06 20 D2 09 3D
0861:4C 37 08 C9 8C D0 03 4C FC
0869:01 08 C9 93 D0 06 20 12 5F
0871:0D 4C 37 08 C9 13 D0 06 C4
0879:20 5F 0D 4C 37 08 C9 11 56
0881:D0 06 20 FF 0D 4C 37 08 8F
0889:C9 1D D0 06 20 7E 0D 4C A1
0891:37 08 C9 91 D0 06 20 E0 51
0899:0D 4C 37 08 C9 9D D0 06 17
08A1:20 0D 4C 37 08 C9 20 D0 7A
08A9:09 20 55 0E 20 7E 0D 4C 33
08B1:37 08 C9 45 D0 09 20 1E F5
08B9:0E 20 7E 0D 4C 37 08 C9 92
08C1:40 D0 06 20 38 0F 4C 37 B6
08C9:08 C9 89 D0 06 20 A8 0F 9F
08D1:4C 37 08 C9 85 D0 06 20 0F
08D9:E9 0F 4C 37 08 C9 86 D0 E4
08E1:06 20 31 10 4C 37 08 C9 3D
08E9:8A D0 03 20 5C 10 C9 8B 18
08F1:D0 06 20 DC 09 4C 37 08 AD
08F9:C9 88 D0 06 20 E9 10 4C A0
0901:37 08 C9 03 D0 03 20 49 36
0909:09 4C 37 08 A9 93 20 D2 C8
0911:FF A9 51 A0 15 20 1E AB D2
0919:A9 00 8D 10 11 A9 77 A0 71
0921:15 20 1E AB EE 10 11 AD CB
0929:10 11 C9 0B D0 EF A9 98 A3
0931:A0 15 20 1E AB 20 E4 FF 66
0939:F0 FB C9 59 D0 08 A9 0E 99
0941:20 D2 FF 20 E9 10 60 20 8A
0949:2A 0E A9 EF A0 11 20 1E CF
0951:AB 20 E4 FF F0 FB C9 87 70
0959:D0 06 20 D2 09 4C 53 09 AF
0961:C9 8B D0 06 20 DC 09 4C 88
0969:53 09 C9 0D D0 E3 AD 0B ED
0971:11 29 0F 8D 0C 11 A9 1B 24
0979:A0 12 20 1E AB 20 E4 FF ED
0981:F0 FB C9 87 D0 06 20 D2 6E
0989:09 4C 7F 09 C9 8B D0 06 D7
0991:20 DC 09 4C 7F 09 C9 0D 91
0999:D0 E3 AD 0B 11 29 0F 8D 4C
09A1:0D 11 A9 28 85 FD A9 D8 86
09A9:85 FE A2 00 A0 00 B1 FD F8
09B1:29 0F CD 0C 11 D0 05 AD 1A
09B9:0D 11 91 FD C8 C0 28 D0 13
09C1:ED 20 62 0E E8 E0 18 D0 CB
09C9:E3 20 E6 09 20 62 0D 60 48
09D1:EE 0B 11 AD 0B 11 8D 20 F2
```

```
09D9:D0 60 CE 0B 11 AD 0B 11 5D
09E1:8D 20 D0 60 20 26 0F A9 44
09E9:14 A0 11 20 1E AB 60 20 D2
09F1:8C 0E 20 26 0F A9 6C A0 CC
09F9:11 20 1E AB 20 B4 0E AD B8
0A01:13 11 F0 07 20 8C 0E 20 E0
0A09:E6 09 60 A9 00 85 9D 20 EA
0A11:CC FF AD 11 11 A2 47 A0 94
0A19:12 20 BD FF A9 08 A2 08 B0
0A21:A0 08 20 BA FF A9 00 A2 80
0A29:28 A0 D8 20 D5 FF 20 CC 52
0A31:FF 20 62 0D 20 38 0F 60 CA
0A39:20 8C 0E 20 26 0F A9 98 9D
0A41:A0 11 20 1E AB 20 B4 0E 25
0A49:AD 13 11 F0 07 20 8C 0E 0A
0A51:20 E6 09 60 A9 00 85 9D 4C
0A59:20 2A 0E 20 CC FF AD 11 9E
0A61:11 A2 47 A0 12 20 BD FF 26
0A69:A9 08 A2 08 A0 08 20 BA 49
0A71:FF A9 28 85 FD A9 D8 85 1B
0A79:FE A9 FD A2 E8 A0 DB 20 03
0A81:D8 FF 20 CC FF 20 62 0D 25
0A89:20 38 0F 60 20 92 0E AD B8
0A91:13 11 F0 0A 20 62 0D 20 F6
0A99:8C 0E 20 E6 09 60 20 2A 1E
0AA1:0E 20 CC FF A9 00 20 BD A9
0AA9:FF A9 04 A2 04 A0 07 20 A3
0AB1:BA FF 20 C0 FF A2 04 20 E5
0AB9:C9 FF A9 28 85 FD A9 D8 BA
0AC1:85 FE A2 00 A0 00 A9 0F 14
0AC9:20 D2 FF 20 FF 0C A9 08 30
0AD1:20 D2 FF B1 FD 29 0F 8C 05
0AD9:11 11 20 19 0B AC 11 11 8E
0AE1:C8 C0 28 F0 03 4C D5 0A 9D
0AE9:A9 08 20 D2 FF A9 0D 20 E6
0AF1:D2 FF 20 62 0E E8 E0 18 87
0AF9:F0 03 4C C6 0A A9 0F 20 72
0B01:D2 FF 20 30 0B A9 04 20 AE
0B09:C3 FF 20 CC FF 20 62 0D 24
0B11:20 8C 0E 20 E6 09 60 0A 44
0B19:0A 0A A8 18 69 08 8D 10 E3
0B21:11 B9 65 12 20 D2 FF C8 11
0B29:CC 10 11 D0 F4 60 A0 00 43
0B31:A9 0D 20 D2 FF C8 C0 05 3A
0B39:D0 F6 20 FF 0C A9 08 20 B0
0B41:D2 FF A9 01 20 19 0B A9 2B
0B49:0F 20 D2 FF A9 E5 A0 12 81
0B51:20 1E AB A9 0D 20 D2 FF 9D
0B59:20 FF 0C A9 08 20 D2 FF 02
0B61:A9 02 20 19 0B A9 0F 20 9F
0B69:D2 FF A9 EE A0 12 20 1E B8
0B71:AB A9 0D 20 D2 FF 20 FF 42
0B79:0C A9 08 20 D2 FF A9 03 EF
0B81:20 19 0B A9 0F 20 D2 FF 88
0B89:A9 F5 A0 12 20 1E AB A9 A1
0B91:0D 20 D2 FF 20 FF 0C A9 53
0B99:08 20 D2 FF A9 04 20 19 CC
0BA1:0B A9 0F 20 D2 FF A9 FD 73
0BA9:A0 12 20 1E AB A9 0D 20 B8
0BB1:D2 FF 20 FF 0C A9 08 20 6C
0BB9:D2 FF A9 05 20 19 0B A9 E3
0BC1:0F 20 D2 FF A9 07 A0 13 7F
0BC9:20 1E AB A9 0D 20 D2 FF 16
0BD1:20 FF 0C A9 08 20 D2 FF 7A
0BD9:A9 19 0B A9 0F 20 D2 FF A5
0BE1:A9 10 A0 13 20 1E AB A9 90
0BE9:0D 20 D2 FF 20 FF 0C A9 AB
0BF1:08 20 D2 FF A9 07 20 19 31
0BF9:0B A9 0F 20 D2 FF A9 18 E5
0C01:A0 13 20 1E AB A9 0D 20 52
0C09:D2 FF 20 FF 0C A9 08 20 C5
0C11:D2 FF A9 08 20 19 0B A9 6D
0C19:0F 20 D2 FF A9 22 A0 13 45
0C21:20 1E AB A9 0D 20 D2 FF 6F
0C29:20 FF 0C A9 08 20 D2 FF D3
0C31:A9 09 20 19 0B A9 0F 20 33
0C39:D2 FF A9 2C A0 13 20 1E 62
0C41:AB A9 0D 20 D2 FF 20 FF 14
0C49:0C A9 08 20 D2 FF A9 0A C8
0C51:20 19 0B A9 0F 20 D2 FF 5A
0C59:A9 35 A0 13 20 1E AB A9 53
0C61:0D 20 D2 FF 20 FF 0C A9 25
0C69:08 20 D2 FF A9 0B 20 19 BA
0C71:0B A9 0F 20 D2 FF A9 42 89
0C79:A0 13 20 1E AB A9 0D 20 CA
0C81:D2 FF 20 FF 0C A9 08 20 3E
0C89:D2 FF A9 0C 20 19 0B A9 26
0C91:0F 20 D2 FF A9 4C A0 13 66
0C99:20 1E AB A9 0D 20 D2 FF E7
0CA1:20 FF 0C A9 08 20 D2 FF 4C
0CA9:A9 0D 20 19 0B A9 0F 20 AC
0CB1:D2 FF A9 56 A0 13 20 1E 7D
0CB9:AB A9 0D 20 D2 FF 20 FF 8C
0CC1:0C A9 08 20 D2 FF A9 0E 45
0CC9:20 19 0B A9 0F 20 D2 FF D2
0CD1:A9 65 A0 13 20 1E AB A9 D7
0CD9:0D 20 D2 FF 20 FF 0C A9 9D
0CE1:08 20 D2 FF A9 0F 20 19 43
0CE9:0B A9 0F 20 D2 FF A9 73 33
0CF1:A0 13 20 1E AB A9 0D 20 43
0CF9:D2 FF 60 A9 08 8D 10 11 C9
0D01:A9 20 20 D2 FF CE 10 11 95
0D09:AD 10 11 D0 F3 60 A9 93 35
0D11:20 D2 FF A9 14 A0 11 20 EF
0D19:1E AB A9 28 85 FD A9 D8 35
0D21:85 FE A2 00 A0 00 A9 00 6A
0D29:91 FD C8 C0 28 D0 F7 20 45
0D31:62 0E E8 E0 18 D0 ED A9 B4
0D39:28 85 FD A9 04 85 FE A2 F9
0D41:00 A0 00 A9 A0 91 FD C8 2E
0D49:C0 28 D0 F7 20 62 0E E8 F6
0D51:E0 18 D0 ED 20 62 0D 20 9F
0D59:E6 09 60 20 2A 0E A9 00 14
0D61:8D 0E 11 8D 0F 11 A9 28 F8
0D69:85 FB A9 04 85 FC A9 28 56
0D71:85 F9 A9 D8 85 FA 20 3C 24
0D79:0E 60 20 2A 0E EE 0E 11 B2
0D81:AC 0E 11 C0 28 F0 03 4C FA
0D89:AC 0D AE 0F 11 E0 17 F0 2F
0D91:14 A9 00 8D 0E 11 EE 0F 9A
0D99:11 AC 0E 11 20 7E 0E 20 71
0DA1:7E 0F 4C AC 0D CE 0E 11 E3
0DA9:20 3C 0E 60 20 2A 0E CE 3F
0DB1:0E 11 AC 0E 11 C0 FF F0 0A
0DB9:03 4C DC 0D AE 0F 11 F0 99
0DC1:14 A9 27 8D 0E 11 CE 0F 6F
0DC9:11 AC 0E 11 20 70 0E 20 69
0DD1:8C 0F 4C DC 0D EE 0E 11 9E
0DD9:20 3C 0E 60 20 2A 0E CE 6F
0DE1:0F 11 AE 0F 11 E0 FF F0 8B
0DE9:09 20 70 0E 20 8C 0F 4C 1D
0DF1:FB 0D A9 00 8D 0F 11 20 6D
0DF9:3C 0E 60 20 2A 0E EE 0F 3A
0E01:11 AE 0F 11 E0 18 F0 09 96
0E09:20 7E 0E 20 7E 0F 4C 1A 7B
0E11:0E A9 17 8D 0F 11 20 3C 93
0E19:0E 60 AC 0E 11 A9 00 91 8B
0E21:F9 A9 2B 91 FB 60 AC 0E EB
0E29:11 B1 FB C9 AB F0 04 A9 29
0E31:00 91 F9 A9 A0 91 FB 60 2F
0E39:AC 0E 11 B1 F9 29 0F C9 C8
0E41:00 D0 09 A9 2B 91 FB A9 8E
0E49:01 91 F9 60 A9 AB 91 FB AA
0E51:60 AC 0E 11 AD 0B 11 91 E8
0E59:F9 A9 AB 91 FB 60 18 A5 A2
0E61:FD 69 28 85 FD A5 FE 69 22
0E69:00 85 FE 60 38 A5 FB E9 07
0E71:28 85 FB A5 FC E9 00 85 F1
0E79:FC 60 18 A5 FB 69 28 85 E4
0E81:FB A5 FC 69 00 85 FC 60 AB
0E89:A2 00 20 FF E9 60 20 8C 98
0E91:0E A9 00 8D 13 11 20 26 3B
0E99:0F A9 40 A0 11 20 1E AB AA
0EA1:20 E4 FF F0 FB C9 59 F0 C0
0EA9:06 A9 01 8D 13 11 60 60 2A
0EB1:A9 00 8D 13 11 A0 00 A9 3A
0EB9:20 99 56 12 99 47 12 C8 0F
0EC1:C0 0F D0 F3 20 2F 0F A0 D7
0EC9:00 8C 11 11 20 E4 FF F0 C1
0ED1:FB C9 0D F0 30 C9 14 D0 B0
0ED9:0F C6 D3 A9 A0 20 D2 FF 6F
0EE1:C6 CE 11 11 4C D0 0E C9 D3
0EE9:20 F0 08 C9 2E 90 DC C9 27
0EF1:5B B0 D8 AC 11 11 C0 0F 2B
0EF9:F0 07 99 56 12 20 D2 FF 9F
0F01:C8 4C CD 0E AD 11 11 D0 D5
0F09:06 A9 01 8D 13 11 60 A0 CB
0F11:00 B9 56 12 99 47 12 C8 60
0F19:CC 11 11 D0 F4 8C 11 11 1E
0F21:60 18 A2 00 A0 00 20 F0 FF
0F29:FF 60 18 A2 00 A0 06 20 3B
0F31:F0 FF 60 20 8C 0E 20 26 D8
0F39:0F A9 C4 A0 11 20 1E AB DC
0F41:20 26 0F A9 0F A2 08 A0 29
0F49:0F 20 BA FF A9 00 20 BD 99
0F51:FF 20 C0 FF A2 0F 20 C6 E7
0F59:FF 20 CF FF C9 0D F0 05 E2
0F61:20 D2 FF D0 F4 A9 0F 20 DD
0F69:C3 FF 20 CC FF 20 E4 FF 84
0F71:F0 FB 20 8C 0E 20 E6 09 9B
0F79:60 18 A5 F9 69 28 85 F9 13
0F81:A5 FA 69 00 85 FA 60 38 6F
0F89:A5 F9 E9 28 85 F9 A5 FA 13
0F91:E9 00 85 FA 60 38 A5 FD 32
0F99:E9 28 85 FD A5 FE E9 00 44
0FA1:85 FE 60 20 2A 0E A9 28 55
0FA9:85 FD A9 D8 85 FE 20 62 97
0FB1:0E A2 00 A0 00 B1 FD 8D D9
0FB9:10 11 20 9A 0F AD 10 11 32
0FC1:91 FD 20 62 0E C8 C0 28 8F
0FC9:D0 EB 20 62 0E E8 E0 17 62
0FD1:D0 E1 20 9A 0F A0 00 A9 23
0FD9:00 91 FD C8 C0 28 D0 F9 EA
0FE1:20 62 0D 60 20 2A 0E A9 BF
0FE9:28 85 FD A9 D8 85 FE A0 53
0FF1:00 20 62 0E C8 C0 16 D0 8B
0FF9:F8 A2 00 A0 00 B1 FD 8D 97
1001:10 11 20 62 0E AD 10 11 EF
1009:91 FD 20 9A 0F C8 C0 28 64
1011:D0 EB 20 9A 0F E8 E0 17 37
1019:D0 E1 20 62 0E A0 00 A9 E0
1021:00 91 FD C8 C0 28 D0 F9 34
1029:20 62 0D 60 20 2A 0E A9 09
1031:28 85 FD A9 D8 85 FE A2 9E
1039:00 A0 26 B1 FD C8 91 FD 95
1041:88 88 C0 FF D0 F5 20 62 E0
1049:0E E8 E0 18 D0 EB A0 00 BF
1051:20 87 10 20 62 0D 60 20 8F
1059:2A 0E A9 28 85 FD A9 D8 1A
1061:85 FE A2 00 A0 01 B1 FD C2
1069:88 91 FD C8 C8 C0 28 D0 E8
1071:F5 20 62 0E E8 E0 18 D0 8D
1079:EB A0 27 20 87 10 20 62 BD
1081:0D 60 A9 28 85 FD A9 D8 48
1089:85 FE A2 00 A9 A0 91 FD 71
1091:20 62 0E E8 E0 18 D0 F4 A8
1099:60 A9 28 85 FD A9 D8 85 7F
10A1:FE A9 00 85 F7 A9 C0 85 71
10A9:F8 A2 00 A0 00 B1 FD 91 4D
10B1:F7 C8 C0 28 D0 F7 20 62 A3
10B9:0E 20 C7 10 E8 E0 18 D0 AE
10C1:EA 60 18 A5 F7 69 28 85 08
10C9:F7 A5 F8 69 00 85 F8 60 6D
10D1:A9 28 85 F7 A9 D8 85 F8 B5
10D9:A9 00 85 FD A9 C0 85 FE B9
10E1:20 AE 10 60 20 9E 10 A9 0B
10E9:93 20 D2 FF A9 7D A0 13 CD
10F1:20 1E AB A9 77 A0 14 20 40
10F9:1E AB 20 E4 FF F0 FB 20 42
1101:12 0D 20 D5 10 60 01 00 D4
1109:00 00 00 0B 00 00 00 13 EE
1111:96 12 20 20 20 20 20 20 EA
1119:20 CE 45 45 44 4C 45 57 31
1121:4F 52 4B 20 C7 52 41 50 45
1129:48 49 43 53 20 C5 44 49 49
1131:54 4F 52 20 20 20 20 20 7F
1139:20 20 00 9C 12 D0 52 49 FE
1141:4E 54 45 52 20 52 45 41 83
1149:44 59 20 5B 59 2F 4E 5D 1F
1151:3A 12 20 20 20 20 20 20 FC
1159:20 20 20 20 20 20 20 20 7B
1161:20 20 20 20 20 20 00 12 35
1169:9A CC 4F 41 44 3A 12 20 59
1171:20 20 20 20 20 20 20 20 93
1179:20 20 20 20 20 20 20 20 9B
1181:20 20 20 20 20 20 20 20 A3
1189:20 20 20 20 20 20 20 20 AB
1191:20 20 00 12 99 D3 41 56 E1
1199:45 3A 12 20 20 20 20 20 13
11A1:20 20 20 20 20 20 20 20 C3
11A9:20 20 20 20 20 20 20 20 CB
11B1:20 20 20 20 20 20 20 20 D3
11B9:20 20 20 20 20 20 00 12 8D
11C1:05 20 20 20 20 20 20 20 56
11C9:20 20 20 20 20 20 20 20 EB
```

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11D1:20 20 20 20 20 20 20 20 F3
11D9:20 20 20 20 20 20 20 20 FB
11E1:20 20 20 20 20 20 20 20 04
11E9:20 00 13 12 9F D3 45 4C C2
11F1:45 43 54 20 43 4F 4C 4F 53
11F9:52 20 54 4F 20 42 45 20 81
1201:43 48 41 4E 47 45 44 20 DD
1209:57 49 54 48 20 C6 35 2F EF
1211:C6 36 20 20 20 00 13 12 65
1219:1C D3 45 4C 45 43 54 20 AD
1221:4E 45 57 20 43 4F 4C 4F E9
1229:52 20 57 49 54 48 20 C6 C8
1231:35 2F C6 36 20 20 20 20 D9
1239:20 20 20 20 20 20 20 20 5D
1241:20 00 20 20 20 20 20 20 5D
1249:20 20 20 20 20 20 20 20 6D
1251:20 20 20 20 20 20 20 20 75
1259:20 20 20 20 20 20 20 20 7D
1261:FF C0 C0 C0 C0 C0 C0 FF 64
1269:FF C0 C2 C4 C8 D0 C0 FF 6D
1271:FF C0 D0 C8 C4 C2 C0 FF 1F
1279:FF C0 C0 DE DE C0 C0 FF 4F
1281:FF C0 CC CC CC CC C0 FF 57
1289:FF C0 DC D4 D4 DC C0 FF 62
1291:FF C0 DC DC DC DC C0 FF 2B
1299:FF C0 D2 CC CC D2 C0 FF 48
12A1:FF C0 D4 D4 D4 D4 C0 FF 59
12A9:FF C0 DE C0 C0 DE C0 FF E8
12B1:FF C0 C2 DC DC C2 C0 FF 9F
12B9:FF C0 D0 CE CE D0 C0 FF 50
12C1:FF C0 C0 CC CC C0 C0 FF E5
12C9:FF C0 D4 DC DC D4 C0 FF 42
12D1:FF C0 CC D2 D2 CC C0 FF 38
12D9:FF C0 CC DE DE CC C0 FF 61
12E1:20 3D 20 57 48 49 54 45 34
12E9:00 20 3D 20 52 45 44 00 EF
12F1:20 3D 20 43 59 41 4E 00 1A
12F9:20 3D 20 50 55 52 50 4C 67
1301:45 00 20 3D 20 47 52 45 A9
1309:45 4E 00 20 3D 20 42 4C A2
1311:55 45 00 20 3D 20 59 45 97
1319:4C 4C 4F 57 00 20 3D 20 F2
1321:4F 52 41 4E 47 45 00 20 FF
1329:3D 20 42 52 4F 57 4E 00 D7
1331:20 3D 20 4C 49 47 48 54 CB
1339:20 52 45 44 00 20 3D 20 0C
1341:47 52 41 59 20 31 00 20 43
1349:3D 20 47 52 41 59 20 32 06
1351:00 20 3D 20 4C 49 47 48 87
1359:54 20 47 52 45 45 4E 00 9B
1361:20 3D 20 4C 49 47 48 54 FB
1369:20 42 4C 55 45 00 20 3D B6
1371:20 47 52 41 59 20 33 00 89
1379:12 9E 20 20 20 20 20 20 38
1381:20 20 20 20 20 20 C3 4F 1E
1389:4D 4D 41 4E 44 20 D3 55 56
1391:4D 4D 41 52 59 20 20 20 AA
1399:20 20 20 20 20 20 20 20 BF
13A1:20 20 92 0D 05 20 20 C6 B2
13A9:31 20 3D 20 53 48 49 46 AE
13B1:54 20 44 4F 57 4E 20 20 DB
13B9:20 20 20 20 20 C6 32 20 9E
13C1:3D 20 53 48 49 46 54 20 A9
13C9:55 50 0D 20 20 C6 33 20 F4
13D1:3D 20 53 48 49 46 54 20 B9
13D9:52 49 47 48 54 20 20 20 6C
13E1:20 20 20 C6 34 20 3D 20 4D
13E9:53 48 49 46 54 20 4C 45 5A
13F1:46 54 0D 20 20 C6 35 20 9A
13F9:3D 20 43 4F 4C 4F 52 20 88
1401:55 50 20 20 20 20 20 20 CF
1409:20 20 20 C6 36 20 3D 20 86
1411:43 4F 4C 4F 52 20 44 4F 18
1419:57 4E 0D 20 20 C6 37 20 CE
1421:3D 20 43 4F 4D 4D 41 4E BD
1429:44 20 53 55 4D 4D 41 52 AF
1431:59 20 20 C6 38 20 3D 20 5B
1439:45 58 49 54 0D 0D 20 20 85
1441:D3 D0 C1 C3 C5 20 C2 C1 F1
1449:D2 20 3D 20 50 4C 4F 54 33
1451:20 50 4F 49 4E 54 0D 20 1A
1459:20 20 20 20 20 20 20 20 81
1461:20 C5 20 3D 20 45 52 41 DE
1469:53 45 20 50 4F 49 4E 54 26
1471:0D 00 20 20 20 20 20 20 08
1479:20 20 20 20 40 20 3D 20 DC
1481:52 45 41 44 20 44 49 53 88
1489:4B 20 45 52 52 4F 52 20 C1
1491:43 48 41 4E 4E 45 4C 0D A7
1499:20 20 20 C3 CC D2 2F C8 F2
14A1:CF CD C5 20 3D 20 43 4C 1D
14A9:45 41 52 20 53 43 52 45 A2
14B1:45 4E 0D 20 20 20 20 20 95
14B9:20 20 C8 CF CD C5 20 3D 13
14C1:20 4D 4F 56 45 20 43 55 23
14C9:52 53 4F 52 20 54 4F 20 10
14D1:54 4F 50 20 4C 45 46 54 5C
14D9:0D 0D 20 20 C3 D4 D2 CC B5
14E1:20 CC 20 3D 20 4C 4F 41 37
14E9:44 0D 20 20 C3 D4 D2 CC 61
14F1:20 C6 20 3D 20 46 49 4C AC
14F9:45 0D 20 20 C3 D4 D2 CC F1
1501:20 D0 20 3D 20 50 52 49 77
1509:4E 54 0D 20 20 C3 D4 D2 9F
1511:CC 20 C3 20 3D 20 53 57 8C
1519:41 50 20 43 4F 4C 4F 52 CC
1521:53 0D 0D 20 20 20 9A 12 A4
1529:D0 52 45 53 53 20 41 4E 1A
1531:59 20 4B 45 59 20 54 4F 11
1539:20 52 45 54 55 52 4E 20 A6
1541:54 4F 20 45 44 49 54 4F 01
1549:52 2E 92 00 05 11 11 11 1A
1551:11 11 20 20 20 20 20 20 30
1559:20 20 20 20 AF AF AF AF EC
1561:AF AF AF AF AF AF AF AF 8B
1569:AF AF AF AF AF AF AF AF 93
1571:0D 00 20 20 20 20 20 20 0A
1579:20 20 20 20 CC CC CC CC C1
1581:CC CC CC CC CC CC CC CC AB
1589:CC CC CC CC CC CC CC CC B3
1591:B4 0D 00 99 13 12 11 11 07
1599:11 11 11 11 11 11 1D 1D E7
15A1:1D 1D 1D 1D 1D 1D 1D 1D CB
15A9:1D 1D 1D 1D 1D 4E 45 45 11
15B1:44 4C 45 57 4F 52 4B 0D 96
15B9:0D 1D 1D 1D 1D 1D 1D 1D DB
15C1:1D 1D 1D 1D 1D 1D 1D 1D EB
15C9:1D 9A 12 47 52 41 50 48 60
15D1:49 43 53 0D 0D 1D 1D 1D E0
15D9:1D 1D 1D 1D 1D 1D 1D 1D 04
15E1:1D 1D 1D 1D 1D 1D 96 12 F3
15E9:45 44 49 54 4F 52 0D 0D 21
15F1:0D 1D 1D 1D 1D 1D 1D 1D 14
15F9:1D 1D 1D 1D 9E 12 53 45 98
1601:45 20 43 4F 4D 4D 41 4E A5
1609:44 53 20 5B 59 2F 4E 5D 67
1611:00 00 00 00 00 00 00 00 3D
```

Tile Paint

See instructions in article on page 54 before typing in.

Program 1: Tile Paint

```
1960:55 AA 55 AA 55 AA 55 AA E7
1968:7F BF DF EF F7 FB FD FE EF
1970:FE FD FB F7 EF DF BF 7F 9E
1978:D7 EF D7 BB 7D FE 7D BB E7
1980:FF 55 FF 55 FF 55 FF 55 08
1988:55 EE 55 BB 55 EE 55 BB 54
1990:55 55 55 FF 55 55 55 FF 18
1998:55 55 AA AA 55 55 AA AA CA
19A0:75 55 5D 55 57 55 D5 55 F4
19A8:55 57 55 5D 55 75 55 D5 DC
19B0:55 55 55 55 AA AA AA AA E2
19B8:FF F7 EB DD B6 DD EB F7 41
19C0:FF DD AA 77 FF DD AA 77 7B
19C8:DD DD AA 77 77 77 AA DD FA
19D0:DD DD DD AA 77 77 77 FF 58
19D8:DD 77 DD 77 DD 77 DD 77 0B
19E0:DD FF 77 FF DD FF 77 FF CE
19E8:DD DD DD FF 77 77 77 FF C5
19F0:EE DD BB 77 EE DD BB 77 DE
19F8:77 BB DD EE 77 BB DD EE D5
1A00:AC E9 1A AD EA 1A A2 4C 74
1A08:8E 8D 03 8C 8E 03 8D 8F 3B
1A10:03 A2 0F BD A7 61 9D F0 1B
1A18:1A CA D0 F7 BD B7 61 9D D2
1A20:00 1B E8 D0 F7 AD EB 1A AD
1A28:8D 55 1B AD EC 1A 8D 56 F7
1A30:1B A9 34 8D C0 1B A9 1B 9C
1A38:8D 66 1B 8D 7B 1B 8D C1 2E
1A40:1B A9 4C 8D 19 1B AD ED 4D
1A48:1A 8D 1A 1B AD EE 1A 8D CC
1A50:1B 1B A9 C5 8D 65 1B 8D 30
1A58:7A 1B A9 FC 8D 9F 1B A9 60
1A60:FB 8D A5 1B A9 B1 8D B0 3C
1A68:1B A9 24 8D B1 1B A9 EA 2A
1A70:8D B2 1B 8D EA 1B 8D EB 1F
1A78:1B 8D EC 1B 60 A9 00 85 1C
1A80:24 85 FB A9 13 85 25 85 C0
1A88:FC A9 5F 85 1B A9 19 85 21
1A90:1C 4C 34 1B CD E8 1A D0 35
1A98:0C A0 01 20 C9 03 C9 DF EA
1AA0:F0 09 AD E8 1A 8D 03 FF E0
1AA8:4C 90 03 E6 3D D0 02 E6 0E
1AB0:3E A9 1A 48 A9 F0 48 4C 24
1AB8:80 03 AD 33 11 29 07 A8 BA
1AC0:AD 31 11 29 07 AA BD 1C 47
1AC8:9D 8D EF 1A B9 00 0B 2D DF
1AD0:EF 1A D0 01 60 4C 19 9C B0
1AD8:A0 03 A9 FF A2 8D 8E 8D 49
1AE0:03 8C 8E 03 8D 8F 03 60 CC
1AE8:54 94 1A BA 1A 7D 1A 08 5E
```

Program 2: Basic Tile Patterns Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
XG 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":SLEEP3
GH 40 BLOAD"TILEPAINT":GOTO60
DF 50 FORPB=0TO7:POKE2816+PB,P
      EEK(6496+8*PA+PB):NEXTPB
      :RETURN
GM 60 SYS6656 :REM *** INSTALL
       THE WEDGE
PC 70 COLOR0,2:COLOR1,3:COLOR2
      ,6:COLOR3,7:COLOR4,2
BS 80 GRAPHIC3,1
SQ 90 V=-1:PA=0
BH 100 FORI=3TO147STEP48:V=V+6
      :H=-6
GG 110 FORJ=0TO132STEP33:H=H+8
AG 120 C=C+1:IFC>3THENC=1
HC 130 BOXC,J,I,J+27,I+35
XQ 140 GOSUB50:TPAINTC,J+1,I+1
      ,0
JK 150 CHARC,H,V,STR$(PA),0
DP 160 PA=PA+1:NEXT:NEXT
DM 170 GETKEYA$
AG 180 SYS6872 :REM *** REMOVE
       THE WEDGE
BG 190 COLOR0,12:COLOR4,14:GRA
      PHIC0,1:GRAPHICCLR
```

Program 3: Hi-Res Tile Patterns Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
XG 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":SLEEP3
GH 40 BLOAD"TILEPAINT":GOTO60
DF 50 FORPB=0TO7:POKE2816+PB,P
      EEK(6496+8*PA+PB):NEXTPB
      :RETURN
GM 60 SYS6656 :REM *** INSTALL
       THE WEDGE
```

```
BM 70 COLOR0,15:COLOR1,7:COLOR
      4,15
RQ 80 GRAPHIC1,1
SQ 90 V=-1:PA=0
BH 100 FORI=3TO147STEP48:V=V+6
      :H=-6
CM 110 FORJ=0TO264STEP66:H=H+8
FP 120 BOX1,J,I,J+54,I+35
QB 130 GOSUB50:TPAINT1,J+1,I+1
      ,0
QH 140 CHAR1,H,V,STR$(PA),0
HE 150 PA=PA+1:NEXT:NEXT
HP 160 GETKEYA$
QF 170 SYS6872 :REM *** REMOVE
       THE WEDGE
FF 180 COLOR0,12:COLOR4,14:GRA
      PHIC0,1:GRAPHICCLR
```

Program 4: Pie Chart Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
XG 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":SLEEP3
GH 40 BLOAD"TILEPAINT":GOTO60
DF 50 FORPB=0TO7:POKE2816+PB,P
      EEK(6496+8*PA+PB):NEXTPB
      :RETURN
FS 60 FORN=0TO5:READA$(N),A(N)
      ,X(N),Y(N),P(N):NEXT:A(6
      )=360
BP 70 SYS6656 :REM *** INSTALL
       THE WEDGE
CG 80 COLOR0,15:COLOR1,7:COLOR
      4,15:GRAPHIC1,1
SM 90 FORI=0TO5:CIRCLE1,160,14
      0,80,56,A(I),A(I+1):DRAW
      1TO160,140:NEXT
KQ 100 FORI=0TO5:PA=P(I):GOSUB
       50:TPAINT1,X(I),Y(I),0:
       NEXT
GP 110 FORI=0TO4STEP2:BOX1,0,8
       *I+20,46,8*I+34:PA=P(I)
       :GOSUB50
RS 120 TPAINT1,1,8*I+21,0:CHAR
       1,6,3+I,A$(I),0:NEXT
FB 130 FORI=1TO5STEP2:BOX1,168
       ,8*(I-1)+20,214,8*(I-1)
       +34:PA=P(I):GOSUB50
CG 140 TPAINT1,169,8*(I-1)+21,
       0:CHAR1,27,3+(I-1),A$(I
       ),0:NEXT
BC 150 CHAR1,11,0," ACME FRUIT
        COMPANY ",1:GETKEYB$
JE 160 SYS6872 : REM *** REMOV
       E THE WEDGE
KE 170 COLOR0,12:COLOR4,14:GRA
       PHIC0,1:GRAPHICCLR
MP 180 DATA "APPLES (14%)",0,1
       61,130,8,"ORANGES (8%)"
       ,50,200,130,18
SC 190 DATA "PEARS (11%)",80,1
       80,140,12,"PEACHES (22%
       )",120,170,155,16
GG 200 DATA "PLUMS (12%)",200,
       130,170,3,"GRAPES (33%)
       ",240,159,130,15
```

Program 5: New Patterns Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
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      ., INC."
XG 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":SLEEP3
SG 40 BLOAD"TILEPAINT":GOTO70
DF 50 FORPB=0TO7:POKE2816+PB,P
      EEK(6496+8*PA+PB):NEXTPB
      :RETURN
KJ 60 FORPB=0TO7:READK:POKE649
      6+8*PA+PB,K:NEXT:RETURN
RC 70 PA=6:GOSUB60
ES 80 DATA 255,255,170,85,85,8
      5,170,255
FE 90 PA=9:GOSUB60
JR 100 DATA 221,85,221,255,119
       ,85,119,255
DF 110 SYS6656 :REM *** INSTAL
       L THE WEDGE
CR 120 COLOR0,1:COLOR1,3:COLOR
       2,6:COLOR4,1
EF 130 GRAPHIC3,1
QC 140 CIRCLE1,40,100,30,42
CM 150 CIRCLE2,120,100,30,42
RG 160 PA=6:GOSUB50:TPAINT1,40
       ,100,0
BC 170 PA=9:GOSUB50:TPAINT2,12
       0,100,0
XM 180 GETKEYA$
EH 190 SYS6872 :REM *** REMOVE
       THE WEDGE
JF 200 COLOR0,12:COLOR4,14:GRA
       PHIC0,1:GRAPHICCLR
```

Program 6: Double Paint Demo

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RH 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
XG 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":SLEEP3
GH 40 BLOAD"TILEPAINT":GOTO60
DF 50 FORPB=0TO7:POKE2816+PB,P
      EEK(6496+8*PA+PB):NEXTPB
      :RETURN
GM 60 SYS6656 :REM *** INSTALL
       THE WEDGE
DB 70 COLOR0,1:COLOR1,3:COLOR2
      ,6:COLOR3,7:COLOR4,1
BS 80 GRAPHIC3,1
FP 90 BOX2,10,50,70,150:BOX2,9
      0,50,150,150
JQ 100 PAINT3,11,51,1:PA=10:GO
       SUB50:TPAINT2,11,51,0
CB 110 PAINT3,91,51,1:PA=17:GO
       SUB50:TPAINT2,91,51,0
HG 120 GETKEYA$
QC 130 SYS6872 :REM *** REMOVE
       THE WEDGE
FC 140 COLOR0,12:COLOR4,14:GRA
       PHIC0,1:GRAPHICCLR
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

ScrollEdit

See instructions in article on page 81 before typing in.

Program 1: ScrollEdit

```
0801:1E 08 0A 00 8F 20 53 43 4A
0809:52 4F 4C 4C 49 4E 47 20 96
0811:42 41 53 49 43 20 45 44 FA
0819:49 54 4F 52 00 43 08 14 23
0821:00 8F 20 43 4F 50 59 52 0E
0829:49 47 48 54 20 31 39 38 6E
0831:38 20 43 4F 4D 50 55 54 6D
0839:45 21 20 50 55 42 2E 20 6D
0841:20 00 50 08 1E 00 9E 20 3A
0849:32 31 33 30 3A A2 00 00 84
0851:00 A9 00 8D 00 0D A9 0D 39
0859:85 2C A9 00 8D CF 0A A9 D5
0861:C0 A0 08 20 1E AB AE 8F 89
0869:02 AC 90 02 C0 09 F0 10 F3
0871:8E CD 0A 8C CE 0A A2 68 92
0879:A0 09 8E 8F 02 8C 90 02 4C
0881:AE 14 03 AC 15 03 C0 09 58
0889:F0 10 8E 66 09 8C 67 09 A0
0891:A2 4D A0 09 8E 14 03 8C 42
0899:15 03 A2 F7 A0 08 8E 18 23
08A1:03 8C 19 03 AE 02 03 AC D9
08A9:03 03 C0 08 F0 10 8E F2 6C
08B1:08 8C F3 08 A2 EA A0 08 F1
08B9:8E 02 03 8C 03 03 60 93 33
08C1:11 20 2A 53 43 52 4F 4C 2B
08C9:4C 45 44 49 54 2A 20 20 1A
08D1:43 4F 50 59 52 49 47 48 85
08D9:54 20 31 39 38 38 20 43 FB
08E1:4F 4D 50 55 54 45 21 0D 53
08E9:00 A2 FF 86 3A 20 67 08 34
08F1:4C FF FF 00 00 00 78 48 61
08F9:8A 48 98 48 A9 7F 8D 0D 6C
0901:DD AC 0D DD 30 43 20 02 7D
0909:FD D0 03 6C 02 80 20 BC 84
0911:F6 20 E1 FF D0 33 AD 20 B1
0919:D0 8D F4 08 AD 21 D0 8D 37
0921:F5 08 AD 86 02 8D F6 08 8A
0929:20 15 FD 20 A3 FD 20 18 BF
0931:E5 AD F4 08 8D 20 D0 AD FC
0939:F5 08 8D 21 D0 AD F6 08 3F
0941:8D 86 02 20 5B 08 6C 02 D3
0949:A0 4C 72 FE 2C CF 0A 30 E1
0951:13 AD 8D 02 D0 0E A5 CB FF
0959:C9 03 90 08 C9 07 B0 04 73
0961:A9 40 85 CB 4C FF FF A5 CD
0969:3A C9 FF D0 1D A5 CC D0 02
0971:19 A5 CB C9 01 D0 16 C5 CC
0979:C5 F0 0F AD 8D 02 C9 04 73
0981:D0 08 AD CF 0A 49 FF 8D B3
0989:CF 0A 4C CC 0A 2C CF 0A 07
0991:30 F8 C9 00 D0 1E AD 8D 1B
0999:02 C9 04 D0 ED A5 CB C5 10
09A1:C5 D0 05 AD 8C 02 D0 E2 37
09A9:20 D0 0A 20 C7 0C 20 40 32
09B1:0B 4C CC 0A C9 07 D0 1E C0
09B9:AD 8D 02 C9 04 D0 CB 20 FD
09C1:D0 0A A9 00 85 D3 85 D4 4F
09C9:85 D8 85 C7 A9 18 85 D6 91
09D1:20 6C E5 4C CC 0A AD 8D 08
09D9:02 D0 AF A5 CB C9 04 D0 CF
09E1:60 A9 00 85 D4 85 D8 20 75
09E9:D0 0A A9 FF 85 CC 85 00 86
09F1:A5 D3 48 A5 D6 48 20 1F 66
09F9:0C 2C 0F 0C 10 2D 38 AD 13
0A01:0B 0C E9 01 85 14 AD 0C CE
0A09:0C E9 00 85 15 20 30 0C 8B
0A11:2C 0F 0C 10 16 AD 7B 0C EB
0A19:85 5F AD 7C 0C 85 60 A9 26
0A21:00 85 D6 85 D3 20 40 0B 74
0A29:20 E1 0A 68 85 D6 68 85 6B
0A31:D3 20 7D 0C 20 6C E5 20 46
0A39:C7 0C 85 00 85 CC 4C CC A9
0A41:0A C9 05 D0 0B 20 D0 0A FE
0A49:20 C7 0C 85 D3 4C CC 0A AC
0A51:C9 06 D0 1D 20 C7 0C 20 10
0A59:D0 0A A4 D5 B1 D1 C9 20 D2
0A61:D0 05 88 10 F7 30 04 C4 7E
0A69:D5 F0 01 C8 84 D3 4C CC 2A
0A71:0A A5 CB C9 03 D0 54 20 2E
0A79:C7 0C 20 D0 0A A9 FF 85 02
0A81:CC A5 D3 48 A5 D6 48 20 9D
0A89:10 0C 2C 0F 0C 10 2B EE 05
0A91:0B 0C D0 03 EE 0C 0C AD E5
0A99:0B 0C 85 14 AD 0C 0C 85 63
0AA1:15 20 13 A6 A0 01 B1 5F E0
0AA9:F0 10 A9 00 85 D3 A9 18 56
0AB1:85 D6 A9 0D 20 D2 FF 20 B0
0AB9:E1 0A 68 85 D6 68 85 D3 DD
0AC1:20 7D 0C 20 6C E5 20 C7 CB
0AC9:0C 85 CC 4C FF FF 00 A5 49
0AD1:CF F0 0C A5 CE AE 87 02 28
```

```
ØAD9:AØ ØØ 84 CF 2Ø 13 EA 6Ø 4F
ØAE1:AØ Ø1 84 ØF B1 5F FØ 54 49
ØAE9:C8 B1 5F AA C8 B1 5F 84 B5
ØAF1:49 8D ØC ØC 8E ØB ØC 2Ø 29
ØAF9:CD BD A9 2Ø A4 49 29 7F B7
ØB01:2Ø 8A ØC C9 22 DØ Ø6 A5 ED
ØB09:ØF 49 FF 85 ØF C8 FØ 2C FA
ØB11:B1 5F FØ 28 1Ø EA C9 FF 38
ØB19:FØ E6 24 ØF 3Ø E2 38 E9 3E
ØB21:7F AA 84 49 AØ FF CA FØ 52
ØB29:Ø8 C8 B9 9E AØ 1Ø FA 3Ø Ø2
ØB31:F5 C8 B9 9E AØ 3Ø C5 2Ø Ø7
ØB39:8A ØC DØ F5 6Ø ØØ ØØ 38 4C
ØB41:A5 D3 E9 28 9Ø Ø6 85 D3 5A
ØB49:C6 D6 BØ F6 2Ø 6C E5 A5 22
ØB51:D6 48 8D AA ØB A2 17 86 D8
ØB59:D6 EC AA ØB 9Ø 35 B5 DA BB
ØB61:29 Ø3 B4 D9 1Ø Ø2 Ø9 8Ø 1C
ØB69:95 DA 2Ø FØ E9 2Ø 24 EA 17
ØB71:A5 D2 85 AD A5 F4 85 AF 56
ØB79:A5 D1 85 AC 85 AE 18 69 D2
ØB81:28 85 D1 85 F3 9Ø Ø4 E6 7Ø
ØB89:D2 E6 F4 2Ø D2 E9 A6 D6 C5
ØB91:CA 1Ø C4 68 85 D6 A9 27 32
ØB99:85 D5 2Ø 6C E5 AØ 27 A9 5C
ØBA1:2Ø AØ 27 91 D1 88 1Ø FB BA
ØBA9:6Ø ØØ 86 D6 2Ø FØ E9 2Ø E6
ØBB1:24 EA A9 ØØ 8D ØB ØC 8D Ø8
ØBB9:ØC ØC 8D ØF ØC A8 B1 D1 B3
ØBC1:C9 3A BØ 3E C9 3Ø 9Ø 3A AF
ØBC9:E9 3Ø 48 AD ØB ØC 8D ØD 75
ØBD1:ØC AD ØC ØC 8D ØE ØC A2 FA
ØBD9:Ø9 18 AD ØB ØC 6D ØD ØC 1D
ØBE1:8D ØB ØC AD ØC ØC 6D ØE 57
ØBE9:ØC 8D ØC ØC CA DØ EA 18 33
ØBF1:68 6D ØB ØC 8D ØB ØC 9Ø FA
ØBF9:Ø3 EE ØC ØC CE ØF ØC C8 23
ØC01:DØ BC 2C ØF ØC 1Ø Ø2 68 34
ØC09:68 6Ø ØØ ØØ ØØ ØØ ØØ A2 1Ø
ØC11:18 B5 D9 1Ø Ø5 2Ø AB ØB E9
ØC19:A6 D6 CA 1Ø F4 6Ø A2 ØØ Ø3
ØC21:B5 D9 1Ø Ø5 2Ø AB ØB A6 49
ØC29:D6 E8 E Ø 19 9Ø F2 6Ø A9 4F
ØC31:ØØ 8D ØF ØC A5 2B A6 2C A2
ØC39:AØ Ø1 85 5F 86 6Ø B1 5F Ø1
ØC41:FØ 27 C8 C8 A5 15 D1 5F C5
ØC49:9Ø 1F FØ Ø6 2Ø 6B ØC 88 3F
ØC51:DØ ØE A5 14 88 D1 5F 9Ø 26
ØC59:1Ø Ø8 2Ø 6B ØC 28 FØ Ø9 22
ØC61:88 B1 5F AA 88 B1 5F BØ 3B
ØC69:CF 6Ø A5 5F 8D 7B ØC A5 44
ØC71:6Ø 8D 7C ØC A9 FF 8D ØF E4
ØC79:ØC 6Ø ØØ ØØ A5 D3 C9 28 E7
ØC81:9Ø Ø6 E9 28 85 D3 9Ø F4 B4
ØC89:6Ø 48 A5 D3 C9 ØØ FØ 1F 25
ØC91:C9 27 DØ 17 A5 D8 48 A5 AA
ØC99:D4 48 A9 ØØ 85 D8 85 D4 D2
ØCA1:A9 94 2Ø D2 FF 68 85 D4 66
ØCA9:68 85 D8 68 4C 47 AB 8A 5A
ØCB1:48 98 48 2Ø 4Ø ØB A6 D6 71
ØCB9:B5 D9 29 Ø7 95 D9 68 A8 46
ØCC1:68 AA 68 4C 47 AB A9 ØØ C6
ØCC9:85 D4 85 D8 85 C7 6Ø ØØ 24
```

Program 2: MetaScroll

```
FX 1Ø A=A+1
PQ 2Ø POKE 157,128
BE 3Ø IF A=1 THEN LOAD "METABA
      SIC",8,1
DP 4Ø A$="SYS36864"+CHR$(13)
DF 5Ø A=LEN(A$):IF A>1Ø OR A<1
      THEN STOP
CM 6Ø POKE 198,A
BF 7Ø FOR I=1 TO A
BF 8Ø POKE 63Ø+I,ASC(MID$(A$,I
      ))
JM 9Ø NEXT I
JC 1ØØ LOAD "SCROLLEDIT",8
```

Power BASIC: Three Pack

Article on page 92.

```
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KM 3Ø PRINTTAB(1Ø)"ALL RIGHTS
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BB 4Ø FORI=53121TO53247:READA:
      X=X+A:POKEI,A:NEXT
EQ 5Ø IFX<>19218THENPRINT"ERRO
      R IN DATA STATEMENTS.":E
      ND
CJ 6Ø DATA 32,185,2Ø7,2Ø1,25,1
      76,61,133,251,32
PC 7Ø DATA 185,2Ø7,2Ø1,4Ø,176,
      52,133,211,165,251
SK 8Ø DATA 133,214,76,1Ø8,229,
      32,185,2Ø7,133,253
AH 9Ø DATA 32,185,2Ø7,24Ø,33,1
      33,254,24,1Ø1,253
HQ 1ØØ DATA 2Ø1,26,176,24,166,
      253,32,255,233,23Ø
HS 11Ø DATA 253,198,254,2Ø8,24
      5,96,32,253,174,32
KG 12Ø DATA 158,173,32,247,183
      ,165,2Ø,96,76,72
ME 13Ø DATA 178,169,Ø,133,253,
      169,212,133,254,16Ø
XP 14Ø DATA 1,169,5Ø,145,253,1
      6Ø,5,169,9,145
XB 15Ø DATA 253,16Ø,24,169,15,
      145,253,16Ø,4,169
KP 16Ø DATA 17,145,253,169,2ØØ
      ,133,252,162,Ø,2Ø2
ED 17Ø DATA 2Ø8,253,198,252,2Ø
      8,249,16Ø,Ø,152,145
PG 18Ø DATA 253,2ØØ,192,24,2Ø8
      ,249,96
```

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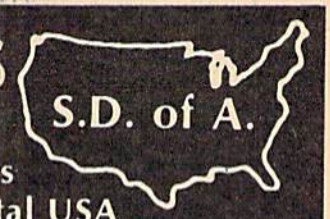

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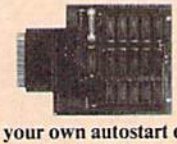

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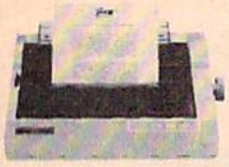

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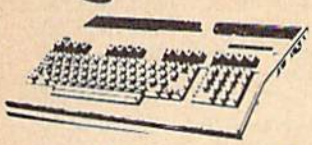

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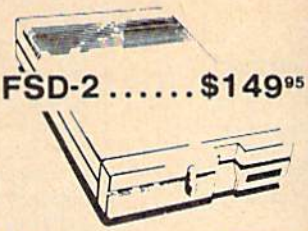

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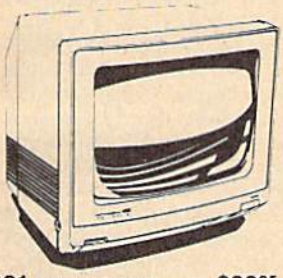

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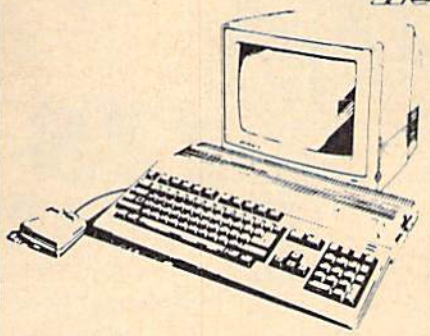

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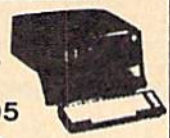

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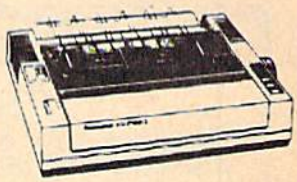

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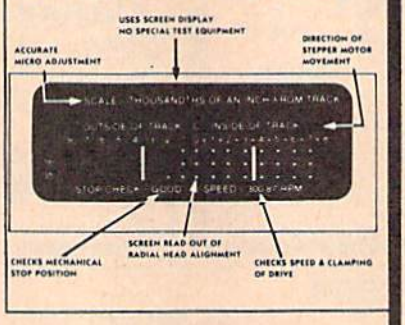
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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ←CRSR→	
{RIGHT}	←CRSR→	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

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[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
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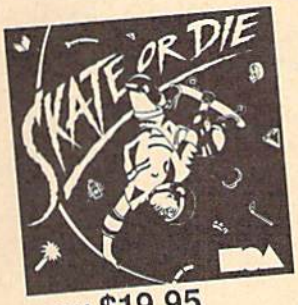

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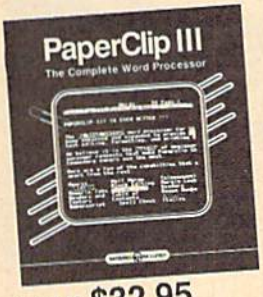

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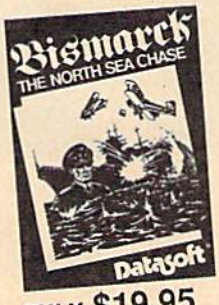

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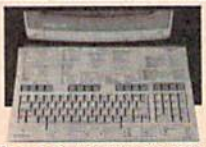

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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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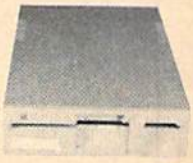

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MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

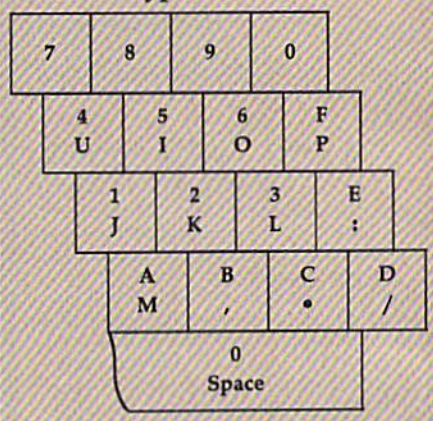
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

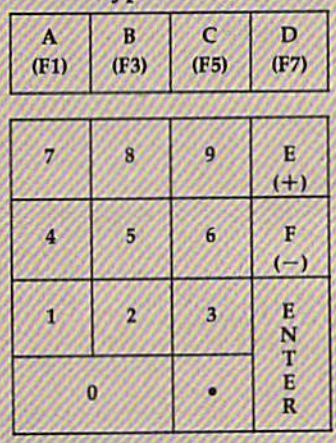
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

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number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP–RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}§8 @§
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

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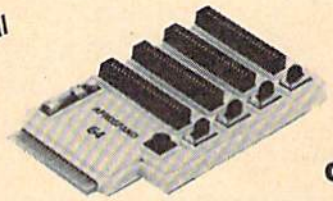

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GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";:GOSUB300:IF IN$<>
      N$ THEN GOSUB1030:IF F
      {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
      {SPACE}":GOSUB400:IF IN
      $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
       THEN PRINT IN$:PRINT"
      {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
      =S$:FOR J=1 TO 2:IF F T
      HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
      24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
      $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
      3*(A$=".")-4*(A$="/")-5
      *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
      ")-9*(A$="U")-10*(A$="I
      ")-11*(A$="O")-12*(A$="
      P")
CM 487 A=A-13*(A$=S$):IF A THE
      N A$=MID$("ABCD123E456F
      0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
      =1)OR F)THEN PRINT B$;:
      J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
      NT B$:J=2:NEXT:I=24:NEX
      T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
      ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
      ((I=0)AND(J=1))THEN GOS
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF(
      I<>B)AND ST THEN F=2:AD
      =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
XP 950 POKE147,0:SYS 63562:IF
      {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
```

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for the C128 & 1571

Super Disk Utilities is the ultimate utilities disk for the 1571 disk drive and C128 computer. Super Disk Utilities is a full featured disk utility system that will perform virtually every CBM DOS function available. No need for numerous utility disks to perform various functions. SDU does it all!

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SDU helps you learn the inner workings of the 1571 drive with the 1571 Memory Monitor and unique RAM Writer. With these options you can assemble, disassemble any section of drive RAM or ROM. Use the Ram Writer to program the 1571 RAM yourself! SDU uses an options window to display all possible choices available at any given time. No need to memorize hidden commands. SDU fully supports a second 1571 drive. Many of the utility functions also work on the 1541 drive. SDU performs many MFM utility functions including analyze MFM disk format, format MFM disks, read a CP/M + directory, format in CP/M + (GCR format) and more. Super Disk Utilities is available for only $39.95!

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- Backup 1581 disks or files with 1 or 2 1581's
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- Perform many CP/M and MS-DOS utility functions
- Perform numerous DOS functions such as rename a disk, rename a file, scratch or unscratch files, lock or unlock files, create auto-boot and much more!

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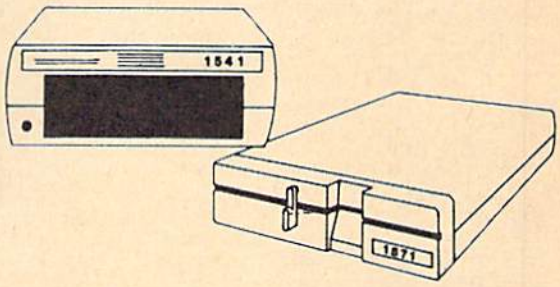

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```
)OR(AD>49151 AND AD<53
248)THEN GOSUB1080:F=0
:RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
{SPACE}INVALID ADDRESS
{DOWN}{BLK}":F=1:RETU
RN
AR 1060 POKE SD+5,31:POKE SD+6
,208:POKE SD,240:POKE
{SPACE}SD+1,4:POKE SD+
4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
240:POKE SD,0:POKE SD+
1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
KE SD+4,0:POKE SD,0:PO
KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
56:Z7=127:BS=256*PEEK(4
627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
):DL$=CHR$(20):SP$=CHR$
(32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
DEF FNLB(A)=A-FNHB(A)*2
56:DEF FNAD(A)=PEEK(A)+
256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
5,"C":KEY 7,"D":VOL 15
:IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
HR$(8):COLOR 0,15:COLOR
4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
{RVS}{2 SPACES}{9 @}
{2 SPACES}"RT$;TAB(12)"
{RVS}{2 SPACES}{OFF}
{BLU} 128 MLX {RED}
{RVS}{2 SPACES}"RT$;TAB
(12)"{RVS}{13 SPACES}
{BLU}"
FE 170 PRINT"{2 DOWN}
{3 SPACES}COMPUTE!'S MA
CHINE LANGUAGE EDITOR
{2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
RESS{4}";:GOSUB 260:IF
{SPACE}AD THEN SA=AD:EL
SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
DING ADDRESS{4}";:GOSUB
260:IF AD THEN EA=AD:E
LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
{SPACE}WORKSPACE [Y/N]?
{4}":GETKEY A$:IF A$<>"
Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
G...";:BANK 0:FOR A=BS
{SPACE}TO BS+(EA-SA)+7:
POKE A,0:NEXT A:PRINT"D
ONE"
DC 220 PRINT TAB(10)"{DOWN}
{BLK}{RVS} MLX COMMAND
{SPACE}MENU {4}{DOWN}":
PRINT TAB(13)"{RVS}E
{OFF}NTER DATA"RT$;TAB(
13)"{RVS}D{OFF}ISPLAY D
ATA"RT$;TAB(13)"{RVS}L
{OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
{OFF}AVE FILE"RT$;TAB(1
3)"{RVS}C{OFF}ATALOG DI
SK"RT$;TAB(13)"{RVS}Q
{OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
CQ",A$):ON A GOTO 340,5
50,640,650,930,940:GOSU
B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
UB 260:IF(AD<>0)OR(A$=N
L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
$<>NL$ THEN 300:ELSE RE
TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
{SPACE}300
PM 290 IF AD>511 AND AD<65280
{SPACE}THEN PRINT BE$;:
RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
NVALID ADDRESS {DOWN}
{BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
+Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
{SPACE}DATA ":GOSUB 250
:IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
,3
BR 360 GOSUB 310:PRINT HEX$(AD
)+":";:IF F THEN PRINT
{SPACE}L$:PRINT"{UP}
{5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
=SP$:FOR J=1 TO 2:IF F
{SPACE}THEN B$=MID$(L$,
I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
{SPACE}I<24 THEN PRINT"
{OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
D A$<":") OR(A$>"@" AND
A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
OTO 470
QB 410 IF A$="-" THEN A$="F":G
OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
D (J=1) OR F) THEN PRIN
T B$;:J=2:NEXT:I=24:GOT
O 480
RD 430 IF A$="{HOME}" THEN PRI
NT B$:J=2:NEXT:I=24:NEX
T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
THEN PRINT B$+LF$;:GOT
O 470
JP 450 IF A$<>LF$ AND A$<>DL$
{SPACE}OR ((I=0) AND (J
=1)) THEN GOSUB 950:GOT
O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
+LF$;:J=2-J:IF J THEN P
RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
{SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
{5 RIGHT}";:L$="
{27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
T#3,A$,B$:IF A$=SP$ THE
N I=25:NEXT:CLOSE 3:GOT
O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
(L$,I,2)=A$:IF I<25 THE
N GOSUB 320:A(I/3)=A:GE
T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
SUB 950:PRINT:PRINT"
{RVS} ERROR: REENTER LI
NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
R I=0 TO 7:POKE B+I,A(I
):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
{BLU}** END OF ENTRY **
{BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
{RVS} DISPLAY DATA ":GO
SUB 250:IF A$=NL$ THEN
{SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
{BLU}PRESS: {RVS}SPACE
{OFF} TO PAUSE, {RVS}RE
TURN{OFF} TO BREAK{4}
{DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
):PRINT RIGHT$(HEX$(A),
2);SP$;:GOSUB 320:NEXT
{SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
$(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
EN PRINT"{BLU}** END OF
DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
OAD DATA ":OP=1:GOTO 66
0
BP 650 PRINT BE$"{DOWN}{RVS} S
AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
ME{4}";F$:IF F$=NL$ THE
N 220
RF 670 PRINT"{DOWN}{BLK}{RVS}T
{OFF}APE OR {RVS}D{OFF}
ISK: {4}";
SQ 680 GETKEY A$:IF A$="T" THE
N 850:ELSE IF A$<>"D" T
HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
THEN 760
EG 700 DOPEN#1,(F$+",P"),W:IF
{SPACE}DS THEN A$=DS$:G
OTO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
A):POKE BS-1,FNHB(SA):P
RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
PRINT#1,CHR$(PEEK(A));:
IF ST THEN A$="DISK WRI
TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
{BLU}** SAVE COMPLETED
{SPACE}WITHOUT ERRORS *
*":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
SE 1:INPUT"{BLK}REPLACE
EXISTING FILE [Y/N]{4}
";A$:IF A$="Y" THEN SCR
ATCH(F$):PRINT:GOTO 700
:ELSE PRINT"{BLK}":GOTO
660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
"{BLK}{RVS} ERROR DURIN
G SAVE: {4}":PRINT A$:G
OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
THEN A$=DS$:F=4:CLOSE
{SPACE}1:GOTO 790
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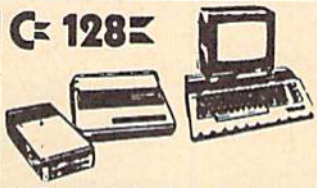

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```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : £43":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       £43";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
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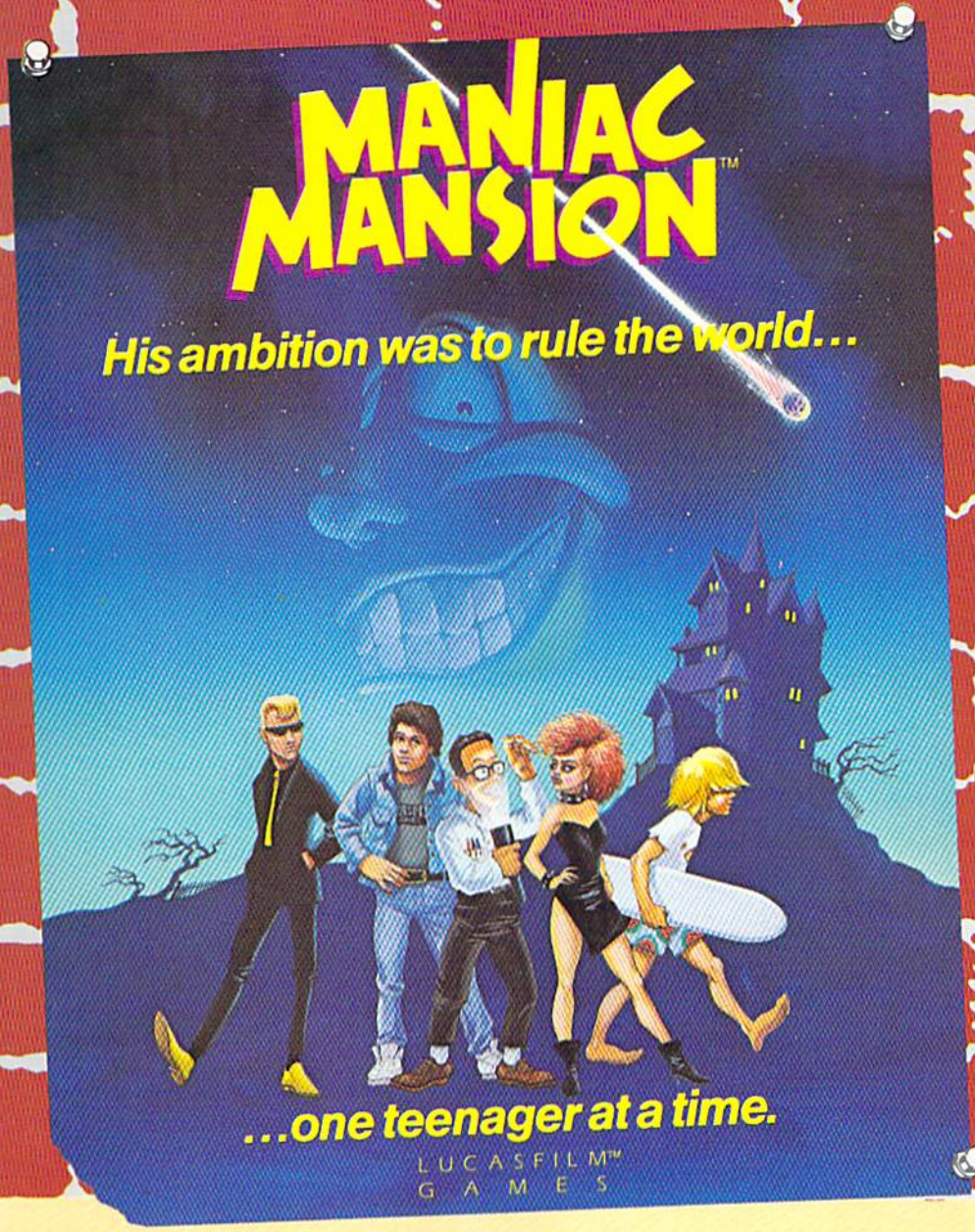

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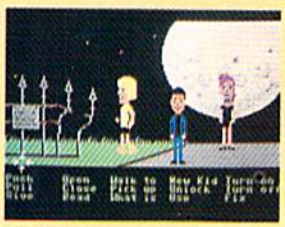
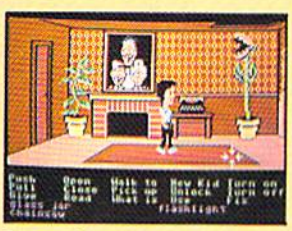
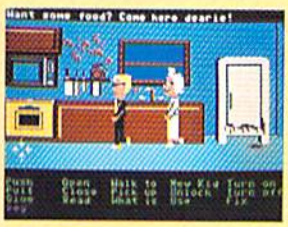
And that's not all! *How it all ends up depends on who you choose to help Dave and how you get them through the story. In* Maniac Mansion, *you get all this, plus super graphics, great animation, and more fun than you can shake a joystick at!*



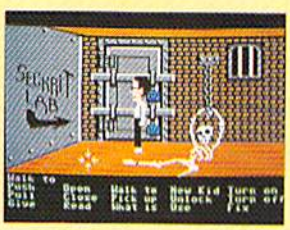
The fate of the world rests upon these shoulders.



Botany 101 never prepared you for *this!*



Meet interesting people...and run from them.



Could this be a clue? You decide.

If you can't find Maniac Mansion at your local retailer, call 1-800-227-6900 to order by mail.

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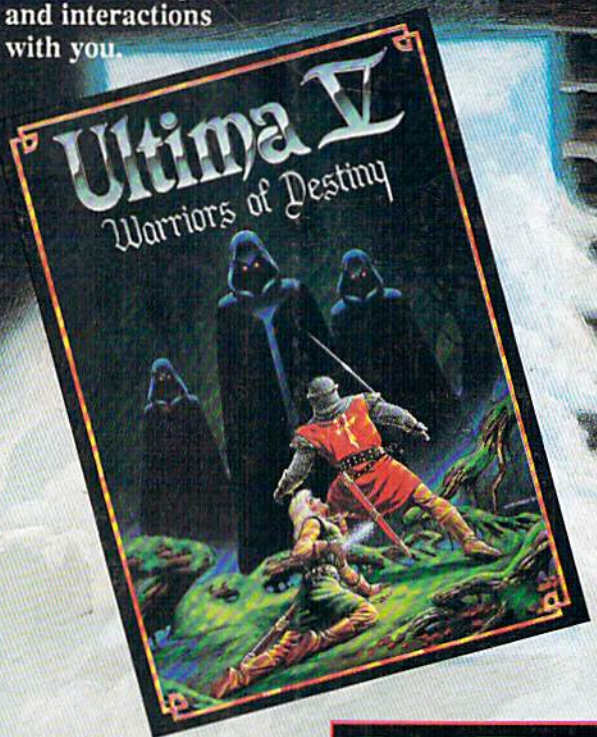
The wait is over... but the excitement has just begun.

More than two years in the making, Warriors of Destiny sets the new standard for role-playing games. No other game can offer you as beautifully detailed a world or as exciting an adventure. Ultima V is the game for all role-playing gamers: Warriors of Destiny will enchant the novice and challenge the expert.

Highlights of Ultima V

- Powerful new combat and magic systems, increasing in sophistication as your skill increases.
- Over twice the graphic detail, animation and sound effects of earlier games.
- Hundreds of truly life-like people who can carry on complex conversations and interactions with you.



Screen displays shown from the Apple™. Others may vary. Allows the use of Ultima IV characters. No previous Ultima experience required.

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